

IceMOS Technology



Multiple applications in multiple markets



Samuel J Anderson, founder and Chief Executive Officer (CEO)

Born in Northern Ireland, Samuel J Anderson – founder and CEO of IceMOS Technology, developed an idea based on energy conservation and environmental progress into a global company. In the Spring of 2004, IceMOS, a high technology semiconductor manufacturing company, was established in West Belfast.

The vision for the company is to provide sensing products and energy-efficient products that enhance the safety and improve the efficiency of electronic systems. Sensors and Super-Junction Metal Oxide Semiconductor Field Effect Transistors (SJ-MOSFETs) are devices used in electronic systems. They're in just about every electronic application. There are dozens in your car, your home and where you work. They're all around you and they do just about everything.

IceMOS designs, manufactures, markets and sells proprietary sensing elements and energy-saving power MOSFET switches to serve our customers in Japan, China, Taiwan, Singapore, Russia, India, USA, Canada and the European Union.

Our factory is located at the top of the Falls Road overlooking the city of Belfast. We employ 70 people, many of them are graduates from Queen's University Belfast (QUB). We're growing and making a contribution to the community in Northern Ireland as part of our social responsibility, providing knowledge-based jobs for today's graduates and many more jobs for future generations to come. We like to think our people are among the best semiconductor manufacturers in the world who come to work each day with a sense of pride and go home to their families each evening with a sense of accomplishment.

» SAM ANDERSON

- » Sam is a highly-accomplished entrepreneur and senior executive with more than 30 years of success within the semiconductor industry
- » Sam's areas of expertise include research and development (R&D), engineering, and business management
- » Sam has served as founder and CEO of IceMOS, since its inception in 2004, and has led the organisation to profitability
- » Sam has BSEE University of Ulster; Masters in Applied Physics Queen's University Belfast; Master of Technology Arizona State University

FACTS ABOUT
 ICEMOS TECHNOLOGY

- » Headquartered in Arizona with Micro-Electro-Mechanical Systems (MEMS) manufacturing operations in Belfast, Northern Ireland, MOSFET design and development center Tokyo in Japan
- » 71 employees (47 engineering; 17 operations; 4 finance; 2 sales and marketing; 1 corporate and administrative) Majority of employees in belfast factory
- » \$60 million Valuation
- » Strong patent portfolio with 100 patents (80 granted; 6 pending; 14 filed/disclosed)
- » MEMS design and engineering facility in Belfast, Northern Ireland; foundry partnership in Japan for SJ MOSFET
- » The company is well positioned to benefit from many of the trends in cleantech and cloud computing by energy conservation and environmental progress
- » Addressing multiple billion dollar markets
- » Clean energy, sensors, luxury watches, and power management

The markets

Our market selection process is motivated by IceMOS's desire to supply world-class products to businesses with high-end products and steady growth. These firms accept the evolution of high technology and frequent design upgrades to address the continuous need for performance improvements at cost effective prices. The global market for sensing and power management silicon chips is estimated to be US\$7 billion.

The applications

Sensing elements enable sensors that provide an analogue interface between the physical world and digital electronic systems. Sensor elements allow digital electronic systems to 'see', 'hear', 'touch', and 'smell'. They are found in multiple applications such as car airbags, electronic parking brakes, tyre pressure monitoring, infrared sensing for night vision sights, and much more. IceMOS has successfully penetrated the automotive market with products in automotive electronic systems. An example of automotive sensors is shown below.

Power supplies must be more efficient, more compact, and less costly to meet today's increasing demand for energy and environmental conservation. The key technology that delivers the performance required by power supplies is a family of power MOSFET switches

called Super-Junction SJMOSFETS. There are many applications for these including data centres for cloud computing, light emitting diodes (LEDs) for indoor and outdoor lighting, and for satellite communications. Cloud computing Data Centre Servers require power systems with long life capability, high efficiency, small size, and high reliability. Super-Junction SJMOSFETS, are arguably the most critical components in Data Centre power electronic systems. IceMOS Super-Junction products are positioned to be an enabling technology for the reduction of energy consumption.

Currently, cloud computing data servers use 15% of all electricity consumed in the USA.

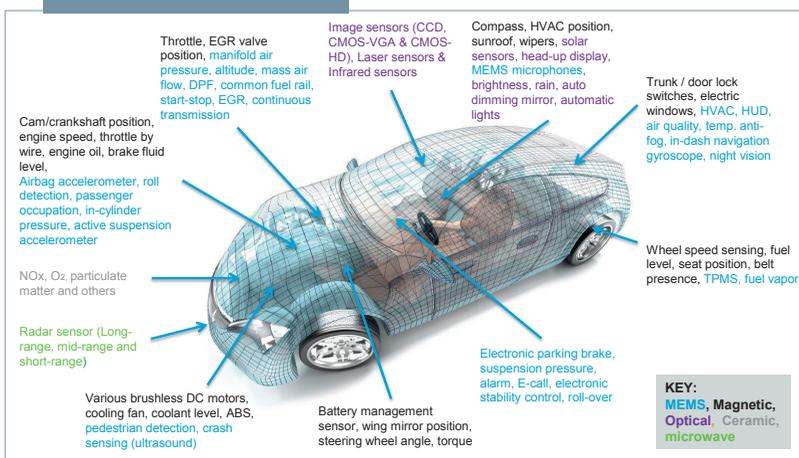
The manufacturing process

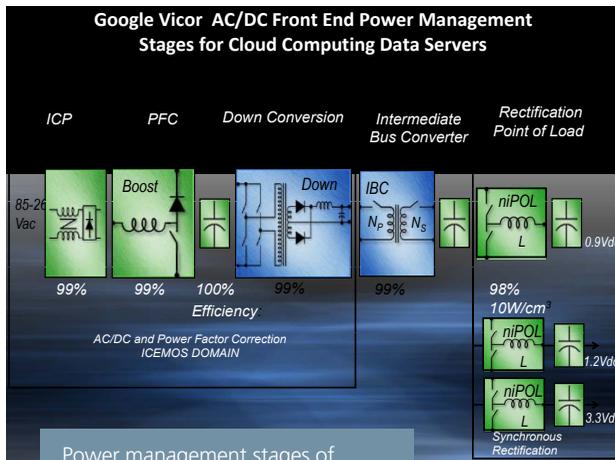
In order to realise the IceMOS vision, control of our own manufacturing is critical. Our silicon chip factory in Belfast has an equipment set that is uniquely suitable for the development and fabrication of sensing products and Super-Junction MOSFETS, allowing IceMOS to position itself in technology and product leadership.

IceMOS matches technology to the application. An example of this is our Cavity Bonded SOI MEMS substrate technology. By using our own optimised manufacturing process, where the product is designed for maximum performance using computer-aided techniques, IceMOS creates a strong manufacturing advantage at competitive prices.

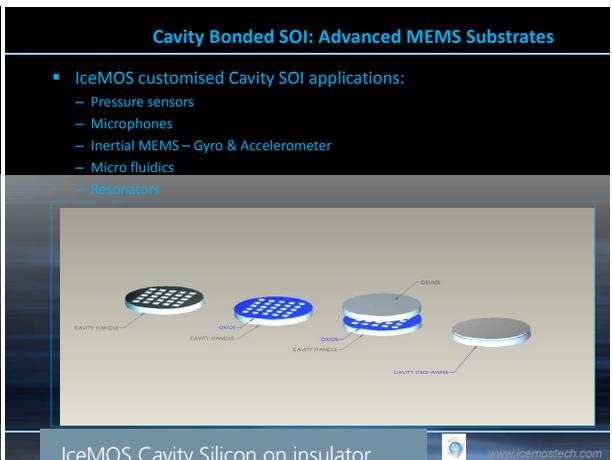
We also use our MEMS technology to manufacture components for high end mechanical watch manufacturers in Switzerland. Companies such as Patek Philippe, Swatch Group, and others need components that are made from silicon rather than steel to allow their watches to keep time accurately over many years without being affected by magnetic interference.

Automotive Sensors cover >100 applications of sensors in cars from safety to body electronics





Power management stages of a data centre power electronics system.



IceMOS Cavity Silicon on insulator sensing element manufacturing process

The sustainable competitive advantage of IceMOS

IceMOS has five sustainable competitive advantages. The first is our portfolio of intellectual property. IceMOS has 70 granted patents plus many more pending.

In the merchant semiconductor business continuous technology development is relentless. The second competitive advantage is our highly accomplished R&D team – the IceMOS Brain Trust. The third, is the rate of technical innovation achieved at IceMOS.

A strong customer-focused manufacturing team working closely with marketing engineers defining products to address customer’s business needs are the fourth and fifth competitive advantages respectively.

Quality management systems leveraging global resources

The company has ISO/TS16949 and ISO 9001 manufacturing certifications in support of our manufacturing operations.

IceMOS has leveraged its global resources by creating cross functional teams between our Japanese and Northern Ireland engineers to develop a Design for Manufacturability Quality Management System (DFMQMS).

The attention to detail driven by the Japanese representatives and the creativity of our Belfast-based manufacturing team results in high quality products. This approach applies scientific principles in a disciplined engineering fashion allowing products to be optimised for performance and centred for manufacturability. The DFMQMS approach is key to achieving high yielding cost effective manufacturing platforms.

The future

The company is well positioned to benefit from many of the trends in clean and green technologies particularly in automotive and cloud computing applications. Autonomous Vehicles (AV) and electrification of cars will require power, local sensing and continuous information from the cloud always connecting data to the car piloting its journey along the highway.

Autonomous driving will require mobile connectivity equivalent to 50 smart phones in each car.

The merging of mobile and automotive consumer electronics for AV will demand efficient high current power management solutions plus hundreds of sensors per car which presents a huge opportunity for IceMOS.

“Autonomous driving will require mobile connectivity equivalent to 50 smart phones in each car”



The rate of technical innovation is an important IceMOS advantage enabling the development of silicon mechanical components in Swiss luxury watches