

## SCIENTIFIC MEDIA RELEASE

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### **A\*STAR IME DEVELOPS ULTRA LOW POWER ANALOG-TO-DIGITAL CONVERTER FOR MEDICAL DEVICES AND WIRELESS SENSOR NODES**

Singapore, 14 August 2012 – Researchers from A\*STAR IME have developed an analog-to-digital converter (ADC) that uses only 400 nW, the lowest power consumption reported to date amongst today's standard processing technology. The novel converter design decreases the total power consumption of an implantable 100-channel neural recording microsystem by more than 20%, reducing the patient's exposure to electromagnetic radiation in the brain tissue when powered wirelessly during the data acquisition of complex brain activity for medical purposes. The converter can also prolong the battery life of other wearable and implantable medical devices and wireless sensor nodes. The ability to extend the battery life and reduce the electromagnetic radiation<sup>1</sup> exposure from implantable devices will significantly reduce the patient's cost, risk and invasiveness of the surgical procedures involved. Neuroprosthetics, which serve to restore motor functions in paralysed patients due to impaired nervous systems, can potentially benefit from IME's low power ADC technology.

Elaborating on the research breakthrough, Dr Cheong Jia Hao, the IME scientist who conceptualised and designed the converter integrated circuits (ICs), said, "The ADC employs a tri-level switching scheme to achieve an elegant and simplified digital logic design. By reducing the capacitor charging voltage and the number of complex arithmetic steps in each data conversion cycle, we can boost the energy efficiency to just 19.5 fJ per conversion step, which contributes to significant total power savings without sacrificing data

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<sup>1</sup>The reduced power consumption leads to the lower electromagnetic power transmitted from outside when powered wirelessly.

resolution and affecting other hardware features.” The converter is fabricated with 0.18- $\mu\text{m}$  CMOS processes, a mature standard processing technology for large volume production.

Professor Dim-Lee Kwong, Executive Director of IME, said, “IME’s data converter is in synergy with industry’s roadmap to drive energy efficient and sustainable solutions. The power saving highlight in the new technology can also be harnessed for applications that require intensive data conversion and where ultra low power consumption is paramount. The ultra low power converter will become one of the key elements in emerging wireless sensor networks, sensor clouds, and sensor fusion for various important applications such as environmental monitoring, industrial monitoring and control, green buildings, smart transportation, and e-health.”

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### **About the Institute of Microelectronics (IME)**

The Institute of Microelectronics (IME) is a research institute of the Science and Engineering Research Council of the Agency for Science, Technology and Research (A\*STAR). Positioned to bridge the R&D between academia and industry, IME's mission is to add value to Singapore's semiconductor industry by developing strategic competencies, innovative technologies and intellectual property; enabling enterprises to be technologically competitive; and cultivating a technology talent pool to inject new knowledge to the industry. Its key research areas are in integrated circuits design, advanced packaging, bioelectronics and medical devices, MEMS, nanoelectronics, and photonics. For more information, visit IME on the Internet: <http://www.ime.a-star.edu.sg>.

### **About the Agency for Science, Technology and Research (A\*STAR)**

The Agency for Science, Technology and Research (A\*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A\*STAR oversees 14 biomedical sciences, and physical sciences and engineering research institutes, and seven consortia & centre, which are located in Biopolis and Fusionopolis, as well as their immediate vicinity. A\*STAR supports Singapore's key economic clusters by providing intellectual, human and industrial capital to its partners in industry. It also supports extramural research in the universities, hospitals, research centres, and with other local and international partners.

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