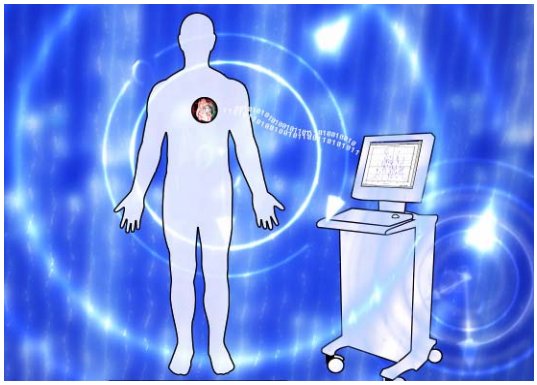
SubQore Implantable Radio



Cambridge Consultants has designed a new ‘control and communications’ radio architecture for in-body medical diagnostic and therapeutic applications.

Called SubQore, it supports medical device manufacturers’ needs for implantable devices that combine very low power requirements with robust wireless communications.

SubQore represents a state-of-the-art foundation, for implantable product manufacturers that wish to develop a custom ASIC that adds next-generation radio communications to their products.

The implantable device market is currently growing at double-digit rates: wireless communications have added a valuable new dimension to in-body therapeutic devices, and enabled a whole new generation of diagnostic aids. For device designers, the challenge is to exploit these new capabilities within extreme size constraints, and with minimal power requirements. SubQore is designed for implementation as a system-on-chip (SoC) solution, to provide a tiny control and communications platform suitable for devices using Medical Implant Communications Service (MICS) frequencies - the medical band now emerging as a global standard.

The SubQore architecture has been designed to be scalable, offering an excellent trade-off between power and data-rate in its most basic implementation, with an upgrade path to achieve higher data rates in an enhanced form. This upgrade would imply no change to the radio protocol. The basic implementation uses a simple modulation scheme and provides data rates up to 400kbit/sec. The radio takes advantage of the unique operating regime of the implant to reduce power consumption. For example, we are able to reduce the wake-up power to an absolute minimum by using an advanced oscillator scheme that fundamentally challenges the ‘status quo’ for such radio designs.

Cambridge Consultants' design combines exceptional power economy with great flexibility. In a typical pacemaker for example, SubQore would deliver more than 10 years of activity from a lithium cell. But it’s equally capable of meeting short-term requirements for high volumes of data, in a swallowable video imaging device, for example.

The SubQore radio is designed to be compatible with the 402-405 MHz 'MICS' (Medical Implant Communications Service) frequency band – in turn compatible with new FCC and ETSI standards - and offers a communications range of 6 feet/2 metres when implanted under the skin. The only other use of this band is for meteorological equipment, minimising the potential for interference and providing an excellent platform for economy of scale through standardisation.

The radio architecture is supported by extensive system simulations and draws upon IC-level intellectual property that we have previously developed and used in high volume radio products, including handsets, pagers and wireless automation devices. The use of this proven IP reduces the cost and risk of the development activity required to develop a custom implementation for a target application. Among the applications that Cambridge Consultants sees for high-performance/long-lifecycle MICS devices are implantable pacemakers, defibrillators, remote telemonitors, orthopaedic devices, pump controllers, nerve stimulators and swallowable imaging and diagnostic systems.

Cambridge Consultants has a long track record in wireless design, working from the IC and silicon level for low-power embedded radio, through to the design of complete wireless devices such as ambulatory monitoring transceivers. Its portfolio embraces standards such as GSM, Bluetooth®, 802.15.4/ZigBee® and DECT, as well as application-specific designs for medical device projects such as ASICs for pacemaker and ECG monitoring equipment. This work has previously led to the spin-out of successful wireless-oriented companies, such as CSR (Cambridge Silicon Radio). In addition to wireless expertise, Cambridge Consultants has a library of digital silicon intellectual property including processor and DSP cores optimised for low power applications, and a library of analogue IP that has been proven on major silicon foundry processes around the world. These elements provide further essential ingredients for single-chip wireless solutions, as control is typically required in addition to a radio. The company's royalty-free RISC processor core, XAP, is integrated into the market leading Bluetooth® chip family for example - which has already been fabricated in volumes of over 50 million.

Ref: CaseNote-WIRE-017 v4.0

Cambridge Consultants

info@CambridgeConsultants.com
www.CambridgeConsultants.com

Cambridge Consultants Ltd
Science Park
Milton Road
Cambridge
England CB4 0DW

Tel: +44 (0)1223 420024
Fax: +44 (0)1223 423373

Cambridge Consultants Inc
101 Main Street
Cambridge MA 02142
USA

Tel: +1 617 532 4700
Fax: +1 617 737 9889