

ASICs for TELEMETRY AND MEDICAL

An HMT Core Competency



Introduction

The imagination is the only limit in conceiving novel devices with wireless sensing and actuation. From RFID tags to implanted pressure sensors, these devices already have a profound effect on our lives.

To leap from our heads into reality, however, these new devices require more than just imagination. They involve the marriage of interdisciplinary skills, with medical, sensor and actuator technologies on one side, and packaging and telemetry (electronic powering, processing and communication) on the other. Moreover remote devices place stringent goals on the cost, size, performance and power consumption, which usually demand integration in an **ASIC**.

HMT provide the ASIC design, telemetry and packaging skills in this partnership, and as a company we are uniquely positioned to work efficiently with diverse customers to enable them to rapidly realise novel devices.



Calibration and identification

Sensors need to be accurate, but tolerance in sensor manufacture and stresses in packaging lead to unavoidable variability, requiring calibration to meet device specifications.

Additionally, in telemetry and medical applications it is usually important to be able to identify remote devices uniquely.

Non-volatile memory cells serve both calibration and identification. EEPROM cells allow reprogramming, whereas One Time Programmable memory (OTP) cells are tamper proof by definition, and offer lower production costs and smaller areas for small bit counts.

The processing technologies which we use provide these types of memory on-chip, allowing the overall chip count to be reduced, and reducing the total silicon area as only the number of bits required are actually integrated. Moreover, the access speed is improved and the memory contents are protected from outside access.



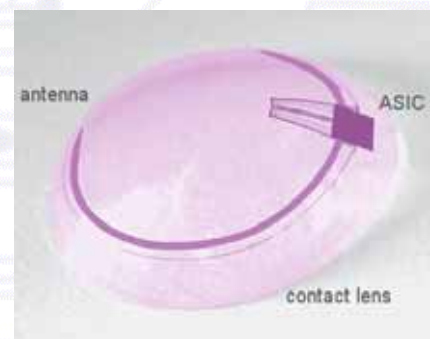
Remote power

Inductive loops are used to power a remote device. Depending on the separation, this generates magnetic fields of widely variable strength in the receiving coil. Devices have to cope with the variation in available power, providing efficient collection when supplies are scarce, and self-protection when it is over abundant.

Devices are often supplied with marginal power, but must behave predictably even in this situation. Power management strategies, such as ensuring sufficient stored energy is available before starting an operation, are key to reliable functionality.

The sensing and analogue functions of the device must be insensitive to the applied field, coupled spikes, noise and over-voltages on the power supply.

HMT prides itself on specialist design knowledge for this difficult environment.



Micro-power

When power is a precious resource, either with remote powering or with long term battery operation, design techniques must be applied to conserve it. This is nothing new to the watch industry, for which Switzerland is famous, and HMT taps the skills of designers who have honed their techniques in this field.



Data transmission

Short range data transmission must optimise the use of the available power, be reliable, and inexpensive. It goes almost without saying that this requires specialised techniques. HMT's experience across a range of different products allows us to rapidly find the right solution for each application.

The key points include:

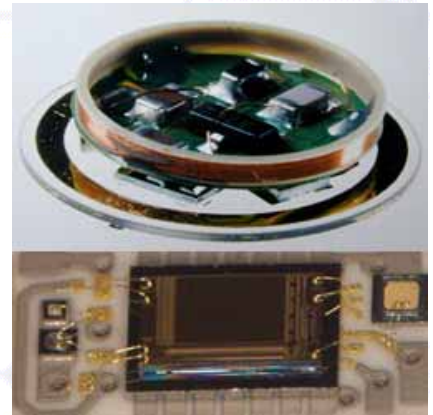
- a **single coil** for both power and (potentially bidirectional) data transfer requires intelligent switching and isolation of blocks.
- **HF techniques** for modulation and demodulation with **wide signal dynamic range** require specialist ASIC design capability and appropriate silicon technologies.
- **clock generation, calibration & extraction with non-quartz solutions** are used to reduce cost and reduce start-up time
- **packet preparation, authentication, error correction and signal processing** require a space and power optimised digital core designed specifically for each application.



Packaging

For miniature devices, an extra degree of control is required in the packaging. This is particularly true for biomedical implants which must also meet stringent biocompatibility requirements. Within the HiDensity group, we are able to offer custom packaging and test:

- **flip-chip** packaging including chip-on-chip achieves the minimum dimensions. This is facilitated by in-house **chip bumping**.
- **custom lead-frames** including **multi-chip modules** and packaging directly with discretives, leads to complete systems within the chip package.



HMT Microelectronic AG
Alfred-Aebi-Strasse 75
2503 Biel/Bienne, Switzerland



Tel: +41 (0) 32 365 11 81
Fax: +41 (0) 32 365 82 80
mailbox@hmt.ch



www.hmt.ch

Since 1978, HMT has been designing ASICs for remote power and transmission applications, as part of the HiDensity group specialised in miniature electronics.

US Representative: Meric Technology, Inc.
Website: <http://www.merictech.com>
Email: sales@merictech.com
Tel: 1 (408) 773-2767
Fax: 1 (408) 773-2781