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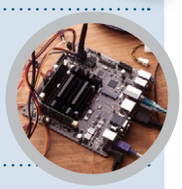
CONTENTS

The week's news and comment

Viewpoint



MEMS sensors

Open source software

Elektra Awards 2016

Latest product reviews

Intel targets 5G with Europe deal

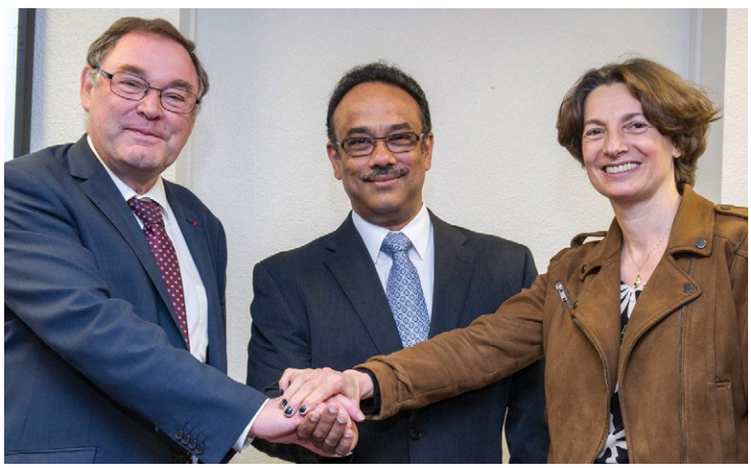
Intel has invested in European R&D, as it signed an agreement with the French Atomic Energy Commission (CEA), owner of the CEA-Leti semiconductor laboratory in Grenoble, in a deal that could increase Intel's access to the EU-funded Horizon 2020 programme.

This is thought to be a first for Intel.

"We think this is the first time Intel has signed a multi-year bi-lateral R&D agreement outside the US," CEA-Leti marketing vice-president Jean-Eric Michallet told *Electronics Weekly* - although Intel is involved in multi-company projects at Europe's other big semiconductor lab, Imec in Belgium.

Details of the deal are scarce: it is for a minimum of five years and includes: developing new semiconductor materials and technologies for mobile; low-power wireless comms; and security. Targets for these are: 5G smartphones, telecoms infrastructure and the IoT.

Access to the EU-funded Horizon 2020 programme is important. "The digital technology collaboration will enable the two sides to develop a shared R&D programme, and jointly submit projects to Horizon 2020, particularly as regards high-performance computing," said CEA.



Daniel Verwaerde, general administrator at CEA, Raj Hazra, Intel general manager for high performance computing, and Leti CEO Marie Semeria

High-performance computing once meant supercomputers, but the boundary between supercomputers and the server farms that constitute 'the cloud' has become increasingly blurred. Both are collections of high-end servers, frequently with Intel processors.

IQE, IMEC brew GaN-on-Si

Welsh wafer maker IQE and Belgian semiconductor lab IMEC have demonstrated 650V GaN-on-Si power diodes on 200mm wafers.

GaN offers fast switching and high breakdown voltage, suiting it to power electronics, but normally requires expensive substrates - which is why there are efforts to grow it on silicon wafers.

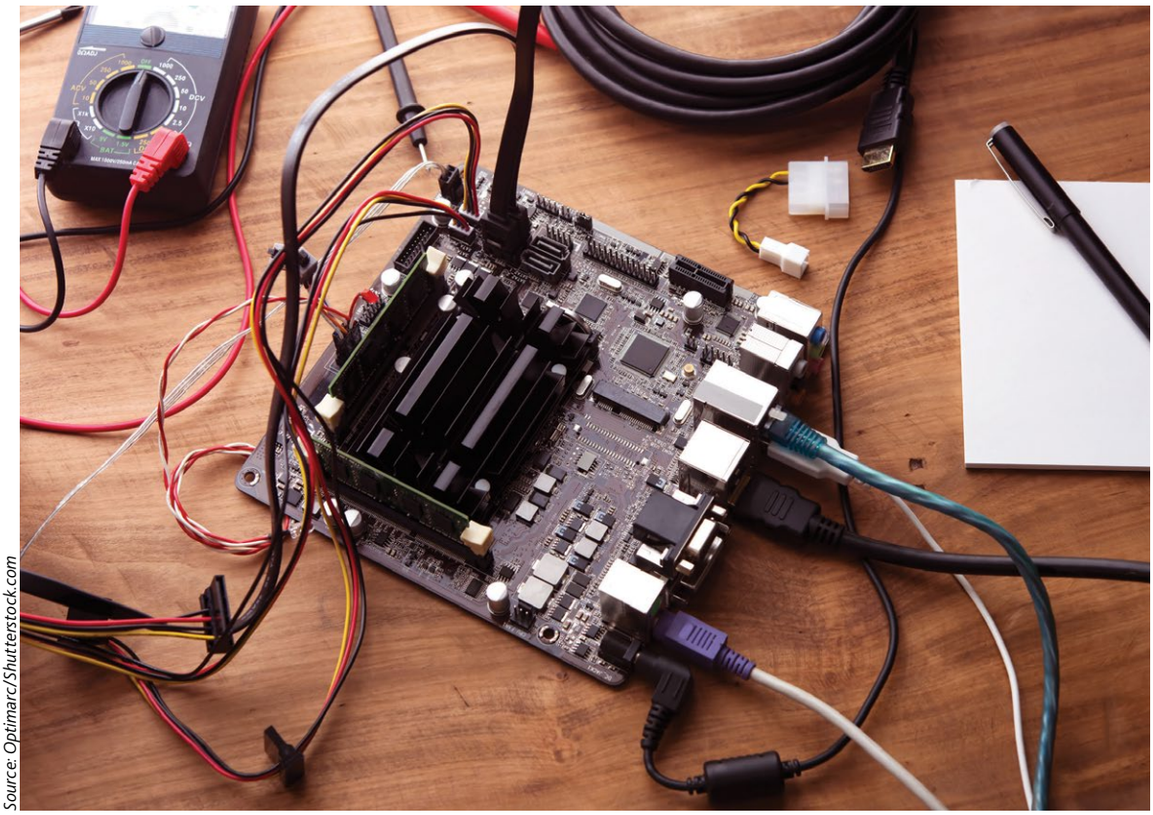
To make the GaN diodes in IMEC's 200mm silicon pilot line, IMEC's proprietary 'gated' edge terminated Schottky diode architecture was used on wafers with buffer layers developed by IQE to lattice-match high voltage GaN to 200mm Si substrates.

The main challenge on power diodes is to obtain devices that simultaneously show low leakage current and low turn on voltage. The 10mm diodes showed a low leakage current up to 650V and low turn-on voltage. Forward and reverse specifications were maintained from 25˚C to 150˚C with a tight distribution.

"The importance of GaN on Si for power devices cannot be understated, particularly as we enter an era of electrically propelled transportation and increasing demands for energy efficient power control systems that require high voltage and high power capabilities," said Wayne Johnson, head of IQE's power business unit.

Ten steps to IoT heaven

IoT devices come in all shapes and sizes, so this is wireless connected product design in 10 steps, writes **David Griffin**



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Getting the overall system design right from the start is essential when developing market-winning IoT products and systems

The internet of things (IoT) promises a huge range of possibilities from industrial asset tracking to agricultural monitoring, from home security to chronic disease monitoring. Some IoT products complement existing businesses, others support whole new business plans.

But what is involved in actually developing your first IoT product?

Devices vary enormously, but here are 10 key points to bear in mind when developing products and systems for clients in consumer, industrial and healthcare markets:

1) Be clear about your business model

Subtle changes to the business model may have profound implications for the cost/performance trade-off of the devices so it's important to be clear what the device promises, and how it adds value to the customer. Early conversations with target customers may highlight value in unexpected parts of the data.

A device originally developed for spotting anomalous events may add value by giving usage data or monitoring daily compliance with a regulatory requirement, but that may change the accuracy requirement of sensors. If you storyboard the whole lifecycle, you will often discover unexpected use cases.

For example, one device was developed to be installed long term in a location, and periodically interrogated with a smartphone by one or more authorised maintenance staff. Because an internet connection was not guaranteed in every installation location, coordination of multiple staff in real-time via the cloud was not possible, creating a synchronisation challenge with implications for the simple device's firmware.

You should be clear about the target user - a device that a B2C user can self-specify and self-install is a very different engineering proposition from one your own technician sets up as part of a B2B service offering.

2) Get the overall system design right first

All other requirements follow from the top level design. Where (between sensor and the cloud) will your raw data be processed? This affects the scale of data transfer, and the power implications of processing at the device level.

If your low-cost device is not always connected, how accurately must it time-stamp the data it records locally? This becomes increasingly important if data is ever combined with data from other devices (or from other sources entirely) to make richer insights.

> Use existing network service models that are supported by universal platform APIs

3) Security is central, not added later

It's worth considering the worst case failure modes if you get security wrong: will you breach privacy, inadvertently compromise someone's home WiFi security or let a burglar into someone's home? Or will a serious medical condition go unnoticed? How will you protect users' data and how will you authenticate new users against newly initialised devices for the first time?

You will be required to automatically patch bugs found in any connected device for some time after sale.

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Prove any algorithms with representative data captured from real sensor electronics as early as practicable

Don't try to create a bespoke protocol. Security through obscurity always ends up meaning no security at all.

4) Ensure you have a realistic power model from the start

Some IoT devices can go for years on a single set of batteries, which may be essential if they are required to be permanently installed to monitor slow-changing infrastructure or track durable assets. Others, such as wearable and disposable medical monitoring devices, might need to run for only a few days, but must run sensors and communications frequently from a tiny inexpensive cell.

Optimal battery life requires consideration of the local/cloud computation split, communication intervals (trading off responsiveness against power saving), and electronics architecture that supports a very low-power sleep mode.

Power consumption considerations extend beyond your device - if your system incorporates a smartphone app, you don't want a reputation for flattening the user's battery.

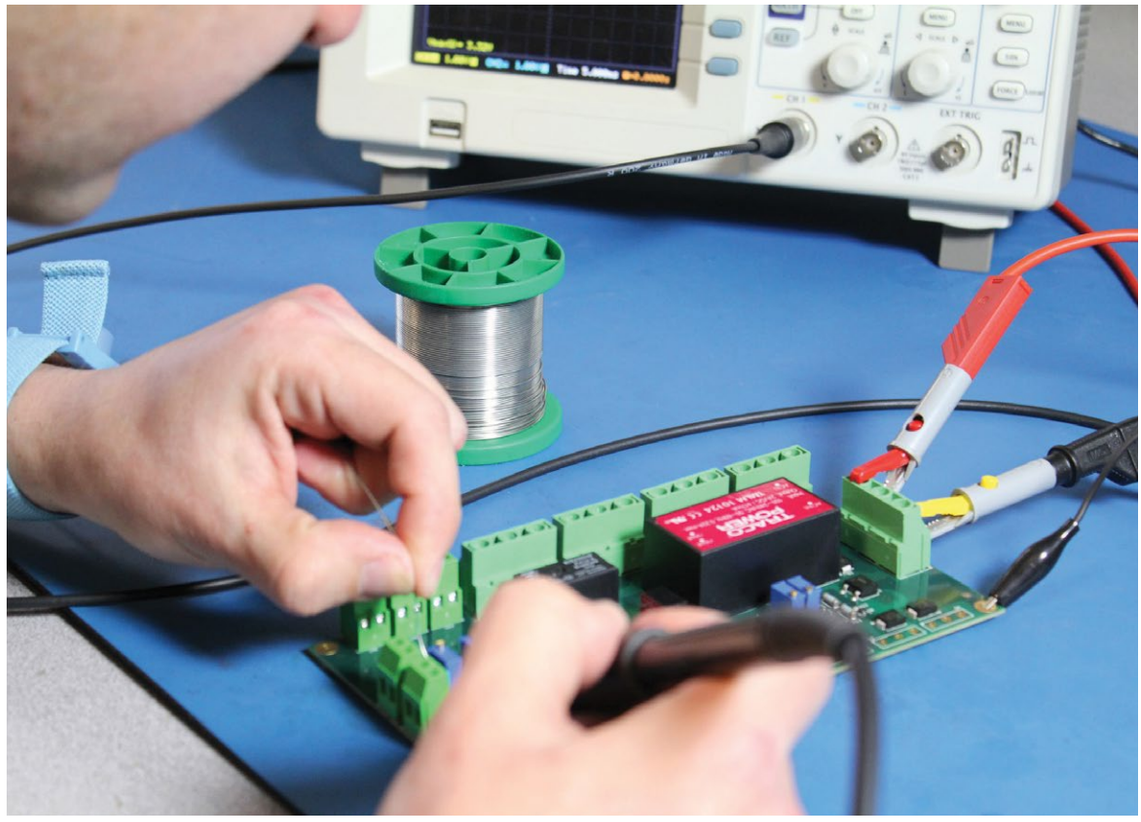
5) Get the key sensor technology right

What accuracy do you need? Be realistic about tolerances and drift, and if there's calibration at manufacture, make sure it's factored into the build price, and included as a use case in the firmware requirements. Gather real data with preferred sensors early and prove you can extract the promised insights, before taking irrevocable decisions about the design of your device.

6) Be conservative about network and platform assumptions

A device that gives only a small connection delay in a quiet lab may be unusable on a crowded wireless network, and the data speed you've read about for Bluetooth may be unavailable when smartphone hardware is running WiFi simultaneously.

Make a plan for technology evolution. In the US, 2G will be mostly switched off by end 2017, and 3G could be partially gone in Europe by 2020 by some estimates. This could be within the lifetime of an individual device.



7) Decide carefully what intermediate platforms you'll support

Connecting your device to the cloud via a bespoke smartphone app means supporting multiple OS versions, and the job will never be finished while new OS versions keep being launched. Alternatively, developing your own hub hardware is costly, but allows you to retain control over release cycles and the hardware support period.

8) Don't reinvent wheels needlessly

There are many existing large-scale infrastructure players. Offerings from Google, Microsoft, Apple and Samsung tend to make the headlines, but Cisco, IBM and Amazon are also heavily investing.

You can choose a fully hosted service for rapid start-up (such as PTC's ThingWorx), or a pre-existing development framework that enables you to quickly build something secure, which you then own and can host yourself (such as Nexiona's MIIMETIQ platform).

But unless this part of the system is your company's core competence, don't build the main infrastructure from scratch.

Furthermore, design your product to use existing network service models that are supported universally by platform APIs, rather than trying to implement a different communications protocol atop existing systems.

> Make a plan for technology. In the US, 2G will be mostly switched off by end 2017

9) Low cost "reference" hardware platforms are for prototyping

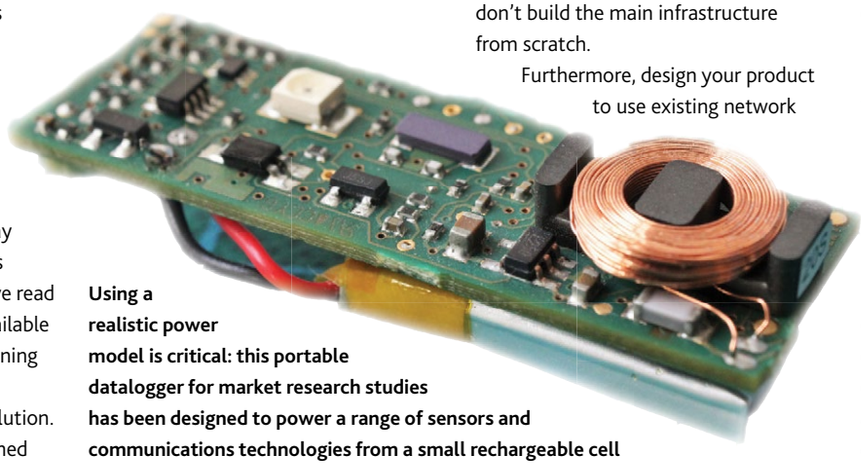
They were mostly never meant to be bulletproof, and you'll need to make your own bespoke hardware design eventually.

For any secure application, you may need to buy in a high reliability communications stack or else redevelop it from scratch.

10) Be prepared for working at the bleeding edge

The best hardware for your product launch in six months probably didn't exist last year. Specifications will be sparse, fluid, and may be completely incorrect and exasperated user communities may be your best source of technical information. But if it was easy, everyone would be doing it.

David Griffin is a product development consultant at 42 Technology



Using a realistic power model is critical: this portable datalogger for market research studies has been designed to power a range of sensors and communications technologies from a small rechargeable cell