

# ULTRA-SMALL WIRELESS MODULES using the latest SIP technology

Nick Wood, President at **Insight SiP** explains how design engineers can use SIP (Systems-in-Package) to squeeze increasingly more functionality into ever smaller spaces for next generation devices

The increased demand for wireless connectivity in portable electronic devices has driven manufacturers to deliver ever smaller, more cost-effective solutions. This makes the integration of SiP into a single product more and more complex and increases technical risk while in the mean time the product development cycle has to be reduced. System-in-Package is a way of providing a complete system in what once was normally for a single component (like a chip in a QFN package), but which inside are increasingly sophisticated systems that contain active semiconductors, passives and RF components.

System-in-Package techniques are not new, but initially were confined to specific applications like military and aerospace. They first entered the mainstream in the memory market, and most "memory chips" in reality are SiPs with a number of 4-wire ball semiconductors.

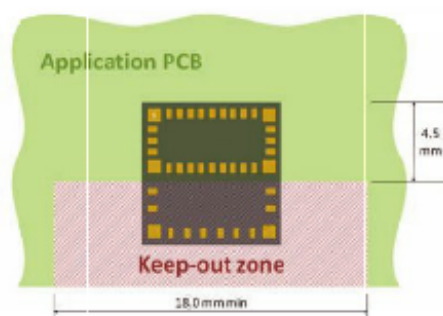
However, the technology has moved beyond SiPs for memory to far more complex solutions. The mobile phone is increasingly based on SiP technology, as the vendors struggle to meet the twin demands of slim design, physical design and ever increasing technological sophistication.

So what are the advantages of this approach? In comparison with traditional PCB mounting, the components are smaller in all dimensions, without compromising performance, or adding to the price. And all the traditional advantages of the module approach – of form-fitting, the need for the designer to get involved in complex RF aspects, having a certified product and so on – remain equally true for a SiP module.

The new ISIP302 module from Insight SiP is an example of how SiP can add significant value to the design process for devices requiring RF technology. Building on the success of its SiP300 module, the company has launched the SiP302 module to offer customers a wider choice, whilst still retaining the high performance and quality characteristics of the Insight SiP design.

## TYPICAL APPLICATIONS AND INDUSTRY REQUIREMENTS

For a number of years Insight SiP has been designing SiP based RF modules, for WiR, GPS or cellular. Inevitably many of which have to be found in today's Smart phones. With its Bluetooth Smart modules, it is now able to offer this technology not



just to high volume purchases in the mobile phone market, but also to the general electronics design community. The Insight SiP Bluetooth Smart module is designed in a primary applications such as temperature measurement (SiTEMP smart

Temperature (SiTch) gas measurement (Microtronics HDS sensor), indoor location (Realink), wearable fitness monitor (Aston), Vibration Caliper (Sylvec), car park barrier control (ComThings) plus many more different end markets.

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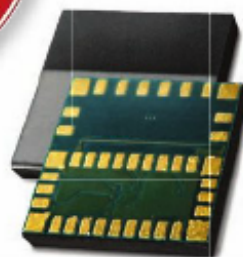


Figure 1 & 2:  
The new ISIP302 module

The new modules are some of the smallest on the market at only 8 x 8 mm in x-y dimensions, with a thickness less than 1mm.

The ISIP302 module has been designed as a "low cost" option aimed at customers for whom unit price is critical, but at the same time, do not want to compromise on their performance or size, and still want a fully functional, certified component. The module is thus ideal for customers seeking to address high volume cost sensitive markets, and applications where size is critical. A high end product (ISIP 307) will follow later this year.

The module integrates the NR71822 chip from Nordic Semiconductor – offering a 32 bit ARM

Cortex CPU, 128kb flash memory, analogue and digital peripherals, SR, IIC and I2C. Nordic is the established leader in the Bluetooth chip market. Combined with an integrated 16Mhz crystal, RF antenna and matching circuit, this module forms a standalone Bluetooth Low Energy node. The module will be fully certified for global markets.

## KEY DESIGN CONSIDERATIONS FOR TOP INDUSTRY DEMANDS

Applications requiring Smart Bluetooth connectivity can be designed using either a traditional discrete approach in which all the individual components are mounted on the PCB or using a module approach in which some of the functions are provided as fully functional devices with simple digital interfaces. Both approaches have their advantages and inconveniences.

The discrete approach may appear to be the cheapest method, looking at component cost; however this may ignore many "hidden" costs. The complexity of designing the RF portion of the circuit including impedance matching and the antenna is often underestimated, and can lead to poor performance and/or schedule overruns. Being RF-based, the application has to be independently certified for radio and Bluetooth SIG compliance. The sum of these hidden costs and the total "time to market" frequently wipe out any potential production cost benefits.

The module approach has a slightly higher production cost than the discrete one, but offers the advantages of much faster development time with no extra certification costs and generally a more compact overall design. Overall, volumes of less than 500 units, generally favour the module approach whereas volumes in excess of 1 million units may be more cost-effectively addressed with a discrete approach.

When using the SiP range of Smart Bluetooth modules, there are very few special requirements, apart from being careful to ensure that the antenna area is devoid of metal.

To support product development, Insight SiP offers a complete development kit together with sample software that provides everything required out of the box to start developing a solution on day one. A complete headboard can be built using the kit together with external sensor development kits so that software development can proceed in parallel with hardware design.

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