

Case study of 2 AFE ICs confirms significant potential for small IC vendors, says Petrov Group

Contributed by the Petrov Group [Tuesday 9 April 2013]

Can a small fabless analog vendor compete with the top-five analog IC vendors in global markets? This question is being asked often, especially in the context of emerging China-based end-system OEMs. Europe used to have many small analog IC specialists – most but not all have by now been acquired. In this case we will compare one such small but well-established company competing with the world's largest analog company, the Petrov Group writes.

The challenge for small companies is to anticipate market needs and develop products that will be ahead of and differentiated from the competition. A competitive comparison can show how relatively similar products are introduced by one big (Texas Instruments) and one small (Systemcom) company. In principle, their products function in the same way, but use different approaches regarding their target application – IC products for photometry, electrochemical and radiation sensing with current input sensors.

Systemcom, a fabless IC design house with 16 employees and US\$1 million revenue, in July 2012 launched an analog front end (AFE) IC – with current input and 13-bit ADC. Its AFE is developed as a family of modular products, designed as IP modules, as well as a standalone ASIC solution.

The solution in the form of an IP module is used when a customer builds a larger system (SoC) from proven and characterized building blocks. IP modules with different characteristics allow more flexibility in the design of an electronic system, resulting in the system optimized for the particular application. The IP modules are designed for an extended temperature range, so together with a consumer and industrial temperature range, the application field is quite broad. The product as an ASIC solution is developed for customers who want a complete system ready for production. The application of the AFE family is based on an electronic system having a sensor with the current input, as in photometry, electrochemical and radiation sensing.

Systemcom's product targets broad general applications but is supported by the flexibility to allow customization of IP modules according to the customers' needs.

In January 2013 Texas Instruments (TI) introduced at CES 2013 the industry's first integrated analog front end for photometry applications. TI, with over 35,000 employees including many from the former National and over US\$13 billion in revenue, is the largest analog IC vendor.

TI's AFE IC also targets photometry applications, including clinical and home-use pulse oximeters, blood glucose meters, and heart rate monitors. Since actual trends are leading toward portable electronics for health monitoring and diagnostics for home use, with options for communication and control from a distance (telemedicine), it was predictable that TI would develop such a product since the company is recognized for providing solutions for nearly all market segments. This particular IC represents a case of dedicated ICs with a known application and customer base in the medical device industry.

So how should the two companies have approached the same application? In this example the difference is a laser-like focus on identified large volume OEMs versus a broader and more flexible offering to potentially more diverse customer groups.

Such approaches were expected and predictable but are very challenging for a small vendor which cannot afford many product misses. It requires a small team of design and application experts who are able to make a more general synthesis of diverse customer requirements. Once again, TI's product line is sharply focused but it is also more limited and less flexible. Systemcom's product line is very broad and flexible – covering a range of market segments.

How a small analog vendor successfully competes

TI's product is developed for a focused medical application. It targets a narrow market segment – a segment with a significant potential due to the rise of low cost, portable medical devices. Customers can efficiently build a medical device around this product since it is already developed and tested for that focused application. For some other application based on photometry, but with different sensor characteristics, TI's product would largely be inadequate.

Systemcom's solution was developed with a different philosophy in mind. It targets potential customers who use different sensor types used in today's market but also targets sensors that will be introduced and commercially available in the near future. Applications for Systemcom's product using suitable sensors are found across multiple vertical market segments – medical and biomedical (pulse oximeters like TI's product, glucose meters, etc.), environmental, automotive, industrial, communication and cutting-edge mobile devices segments. All Systemcom building blocks were designed as IP modules – the modular approach allows a tailored and optimized solution for a particular application – e.g., number of gain stages to reach an overall amplification figure. Based on the particular requirements from a customer, Systemcom can quickly provide an optimized product – either in the form of an IP module or ASIC. This significantly reduces the development cost due to an already optimized design on the block level and allows a very fast time-to-market introduction. Otherwise product integration into the end-system would require a more extensive effort due to additional application development and testing not performed earlier in the development phase. For a small vendor, the benefits of a shorter and cost-effective development cycle would prevail in the overall cost analysis.

The above analysis validates the fundamental differences in the market approach among large and small vendors.

A large vendor develops a dedicated IC with well-defined and limited functionality covering the needs of targeted customers. A small and highly specialized analog vendor develops a more general product for various applications in the form of IP modules and ASICs with customization features and strong support for integration into larger end-systems.

There is plenty of room in the market for both approaches. Customers benefit from the two similar products that are offered, each with an emphasis on different application and system characteristics.

Parameter	Texas Instruments AFE44xx family	Systemcom SC-I-AFE-180F110	Comments and Comparison of SC's and TI's solutions
PERFORMANCE (full-signal path)			
Specified temperature range	0°C – 70°C	-40°C – 125°C	SC has a broader temperature range (commercial vs extended range)
TRANSIMPEDANCE AMPLIFIER (TIA)			
Full scale input current	50 uA (7 selectable current ranges)	1000 uA (8 selectable current ranges)	SC uses broad input current range for many diverse applications
AMBIENT CANCELLATION AND PGA			
Maximal gain setting	4	1296	SC's larger gain supports smaller input signal swing and improved resolution
Cancellation implementation / maximal current range for cancellation	Cancellation performed by external component (microcontroller) / 10uA in discrete steps	Cancellation performed internally by analog circuitry/ entire selected current range (continuous)	SC's continuous cancellation procedure is suited for all ambient conditions
COMMUNICATION INTERFACE			
Communication interface	SPI	SPI	Both solutions use the same communication protocol

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