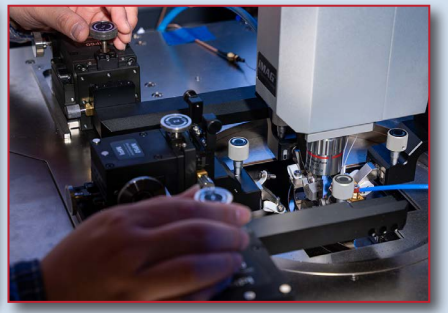
PseudolithIC: Bringing Compound Semiconductors into the Age of RF CMOS

PseudolithIC, a leader in semiconductor heterogeneous integration, was founded in 2021 by Florian Herrault and James Buckwalter, who both remain in leadership as the company grows. PseudolithIC is headquartered in Santa Barbara, Calif., and focuses on creating solutions for satellite communication, cellular and backhaul communications, sensing, aerospace and defense, IoT and long-range radar. PseudolithIC combines highly differentiated semiconductor materials and functionalities into single chips, offering the performance of a MMIC in an RFIC ecosystem. This heterogeneous integration yields a 10 to 100x improvement in performance and efficiency compared to a monolithic approach. Additionally, this approach enables a highly scalable manufacturing process by lowering costs and eliminating waste.

PseudolithIC wafers are constructed from compound semiconductor chiplets embedded in a CMOS wafer. The PseudolithIC approach is categorized as an interposer-based approach where the small, 4 to 6 in. compound semiconductor wafer is diced into chiplets. Common compound semiconductors include GaAs, GaN and SiC. The chiplets are then integrated into a single wafer through cavities etched into a 200 or 300 mm silicon wafer, and interconnects are formed between the chiplets and the silicon interposer. To remove heat from the transistors, the backside of the wafer is metallized to create a thermal backplane. By constraining the compound semiconductor wafer area to realize only transistor chiplets, the cost of each transistor drops dramatically relative to a MMIC. MMIC costs are determined by a combination of wafer yield, die area and screening costs. By combining the low cost and high production quality of the commercial silicon CMOS wafer and constraining the use of the compound semiconductors to only transistor chiplets, costs drop without compromising performance.

PseudolithIC's unique chipsets are applicable to a wide range of applications, including mmWave power amplifiers, low noise amplifiers and Tx/Rx front ends. PseudolithIC's mmWave power amplifiers combine Si CMOS, GaN and InP to operate at the Ka- and W-Bands. The LNAs use the heterogeneous approach to lower both the noise figure and power consumption, lowering costs and overall system power needs. Similarly, the PseudolithIC-powered Tx/Rx front ends enhance efficiency and lower power consumption. Each of these products can be amplified with built-in circuit intelligence and operate in harsh environments, including those with high radiation, cryogenic temperature exposure and mechanical shock.

PseudolithIC partners with world-class foundries globally and owns its heterogeneous integration process and capabilities, supplemented with a variety of in-house design and test capabilities. PseudolithIC designs new products using custom multi-technology process design kits and EDA tools. The team is able to test these new designs with in-house S-parameter, power and noise measurement systems through the W-Band. Additionally, they have a probe station with advanced thermal cycling capabilities for accelerated lifetime measurements. The combination of custom design tools, close foundry partnerships, heterogenous integration capabilities and in-house test equipment allows for a quick prototyping phase, enabling PseudolithIC-powered products to hit the market sooner.

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