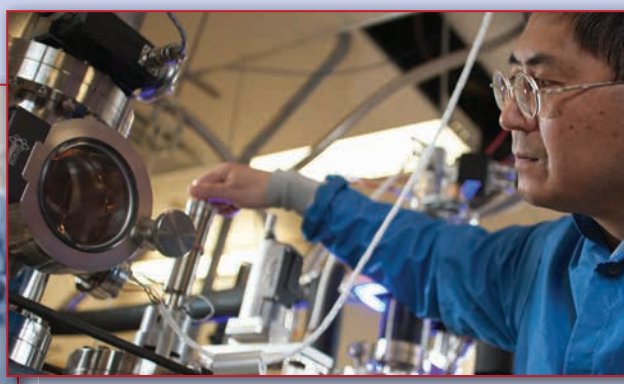
FABS and LABS

National Research Council of Canada Offers GaN Foundry



Scan page using layar app

Asked to list the world's GaN players, Canada probably wouldn't leap to mind. Yet the National Research Council of Canada (NRC) has been providing GaN foundry services for RF and microwave applications for five years, from a $150 million Canadian dollar ($121 million) wafer fab in Ottawa.

The National Research Council is the research and technology arm of the Canadian government. NRC invests in a wide range of industries important to the Canadian economy, from energy to health, to marine biology and aerospace. The mission of the 4,000 researchers and support staff of the CA$ 1 billion organization is to collaborate with industry and universities to enhance innovation and the competitiveness of Canadian industry. Nonetheless, many of NRC's projects cross Canadian borders and support international initiatives.

The National Research Council's exploration of GaN began in 1998, with material growth. The research was a partnership with Nortel, the Canadian telecommunications giant that was pursuing photonics integration. When the telecom industry imploded in the first half of the 2000s, NRC acquired Nortel's equipment and many of their staff and established the Canadian Photonics Fabrication Centre, which includes a 40,000 square-foot wafer fab with 11,000 square feet of Class 100 to 1000 clean room. GaN processes were added to the fab around 2010, and NRC began offering foundry services.

The National Research Council has released two GaN on SiC processes, with a third being developed. Design kits are offered for all three processes. The GaN wafer diameter is 3 inches, constrained by photonics processing. However, conversion to 4 inch wafers is planned in the near future. The two production processes include:

- 0.5 µm gate length, 40 V process with an ft of 13 GHz that achieves 5 W/mm power density
- 0.15 µm gate length, 30 V process with an ft of 35 GHz that achieves 7 W/mm power density.

A near enhancement mode process is being developed and is currently available as a beta release, with the full release planned for later this year. The 0.5 µm enhancement GaN HEMT presently has a threshold voltage of -0.2 V, 1 A/mm saturation current and an operating drain voltage of 30 V. The threshold voltage will be greater than zero in the full release. This process is suited for applications where only a single positive supply is available or power dissipation needs to be minimized.

Given the capacity of the fab, which runs two shifts, five days per week, NRC's foundry service is best suited for concept development and moderate production volumes. Most of their clients are working on aerospace and defense and satellite communications applications, creating MMIC designs for power or low noise amplifiers. The Canadian Space Agency has worked with NRC in the past to provide reliability qualification on an early version of the process. Qualification of the new generation of processes is in progress.

Supporting their business model to provide foundry services, NRC has a small design team that can consult with customers to refine their designs.

Jennifer Bardwell, leader of the GaN electronics program at NRC, says "We are very excited about the potential for GaN electronics, particularly about growing the ecosystem for this technology within Canada."