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MAGNIFYing Photonic Capabilities: Industrialization and Heterogeneous Integration Readiness of the SiN Platform

Since 2016, LIGENTEC has led the development of high-performance Photonic Integrated Circuits (PICs), leveraging proprietary silicon nitride (SiN) technology to enable breakthroughs in quantum computing, telecommunications, autonomous driving, and sensing. The company's all-nitride-core platform achieves ultra-low optical losses (<1 dB/m in the C-band), supports high-Q resonators (>20 million), and enables compact, high-power designs. Its broad transparency window (400–4000 nm) and high damage threshold make SiN a versatile material for cutting-edge photonic systems.

LIGENTEC provides a seamless path from prototyping to high-volume manufacturing via its certified 200 mm CMOS line, with support for Multi-Project Wafer (MPW) runs and advanced integration capabilities. This includes lithium niobate on insulator (LNOI) integration and an extensive Process Design Kit (PDK) library featuring components such as spot-size converters, low-loss delay lines, and tunable resonators.

As part of the MAGNIFY project, LIGENTEC focused on implementing the AN200 Si_3N_4 process technology in a 200mm production line to achieve industrial performance and enable it for ion implantation. A 200 nm Si_3N_4 layer was successfully fabricated on this line, creating an implantation-ready surface. Significant process development achievements include designing test cells for optical loss analysis, evaluating bottom oxide quality, and optimizing lithography, deposition, and etching parameters. Precise control over top oxide thickness (100–500 nm) and comprehensive wafer-level testing have ensured process stability and facilitated continuous improvements, leading to the preparation for a process freeze.

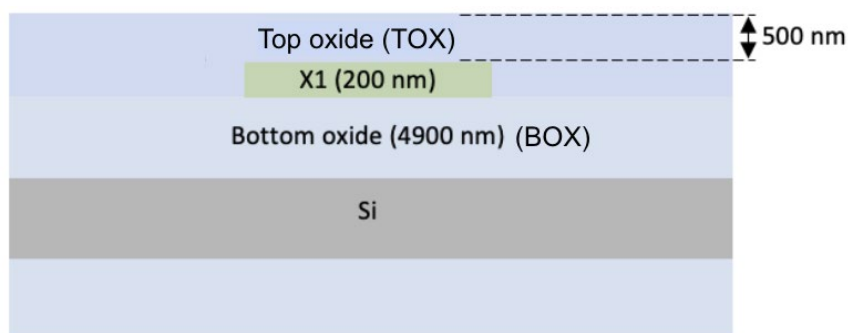


Figure 1: Cross section of the AN200 SiN technology.