**Abstract –** A semiconductor is an element or molecule that lies in between conductors and insulators in its ability to conduct electricity. A semiconductor can be treated with impurities, other elements with varying amounts of electrons, so the material can either allow or block the flow of electric current. This idea forms the basis for the transistor, a component in circuits that manipulates the flow of electricity to perform computations.

Since the transistor’s invention in 1947, silicon has been the semiconductor of choice for electrical circuits due to its availability and the relative ease with which it can be treated with impurities. Over the last seventy years, silicon-based transistors have decreased in size from the palm of a hand to a molecular scale. In doing so, more transistors can be fit in a given device, drastically increasing its computational power. However, the most recently developed silicon transistors are seven nanometers wide, close to the size of an individual silicon atom and in the domain of quantum mechanics. This signals a rapid halt in transistor innovation, as the behavior of transistors at this scale is relatively unpredictable. Because there exists an insatiable desire for improved computing power in government, business, and academia, companies and research groups have turned to other semiconductor materials through which the nature of the transistor can be redefined.

Gallium-nitride (GaN) has been identified as a prime contender to replace silicon in transistors for large-scale computing devices. The compound possesses a fraction of the resistance of silicon, allowing for a more energy-efficient flow of electricity. Though the conventional process used to create GaN is expensive and time-consuming, research groups at institutions such as the Massachusetts Institute of Technology (MIT) have made progress in inventing new, cheaper methods for mass-producing the material. The widespread interest in GaN is likely to be sustained by organizations seeking to maximize computing power in their devices.