

Advantages of Replacing Conventional Transistors with Gallium Nitride Transistors in Power Devices of Electric Vehicle

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Introduction

At present, gallium nitride semiconductor components have gained a lot of ground compared to conventional semiconductor components. This was possible by providing increased performance compared to classic silicon-based components. Following research, this paper reports on the advantages of GaN transistors in electric vehicles over conventional transistors currently in use. As a conclusion of this paper, through the gallium nitride tanners, a much better efficiency is obtained in the systems found on electric vehicles.

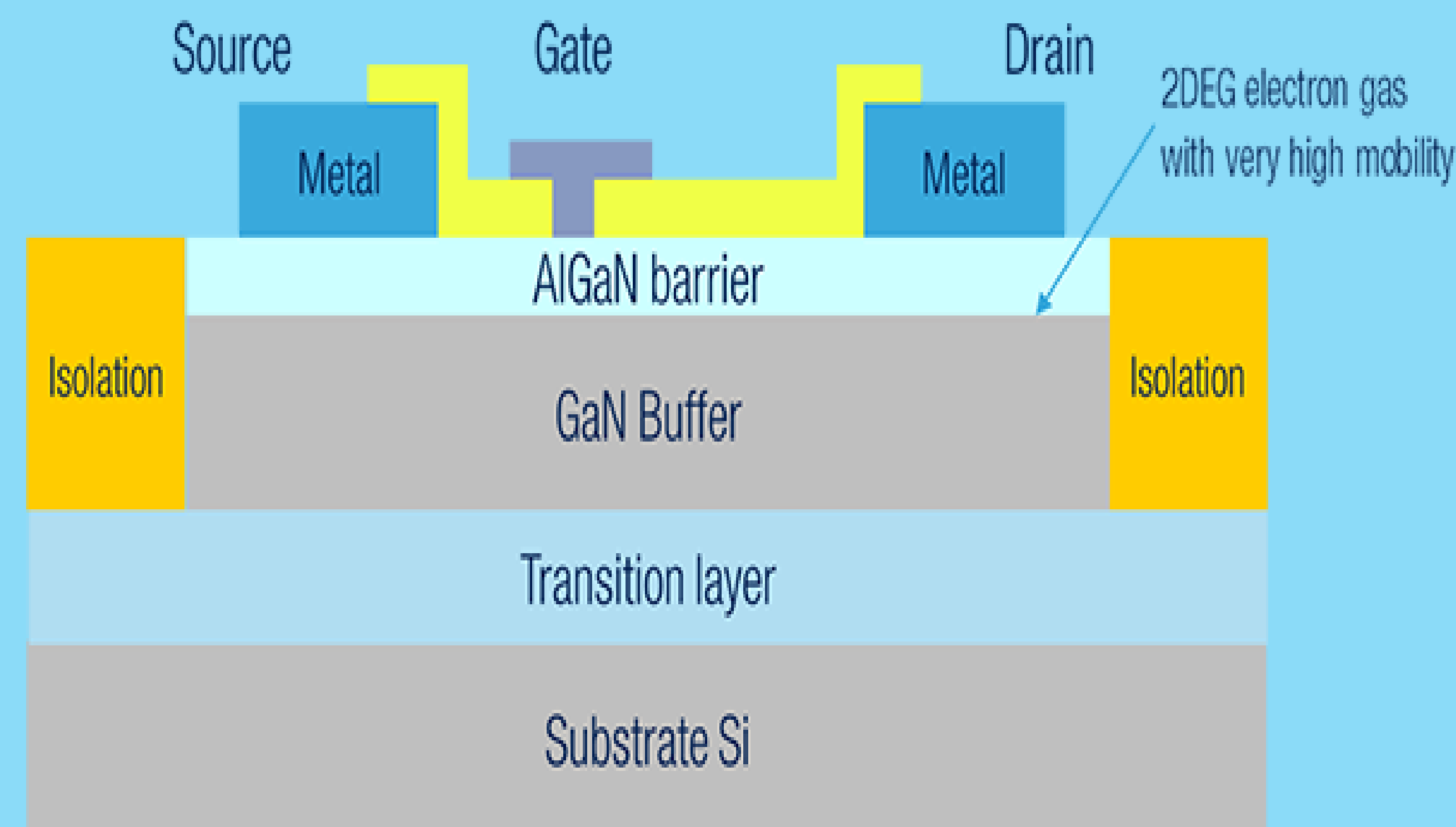


Fig. 1: High Electron Mobility Transistor

Gallium Nitride

Gallium Nitride (GaN) belongs to the family of wide bandgap (WBG) materials. It is a binary compound whose molecule is formed from one atom of Gallium (III-group, $Z=31$) and one of Nitrogen (V-group, $Z=7$) with a wurzite hexagonal structure. In Figure 2 shows the molecular structure of Gallium Nitride.

Its sensitivity to ionizing radiation is low (like other group III nitrides). At military and space applications benefit of advantages as devices have shown stability in radiation environments

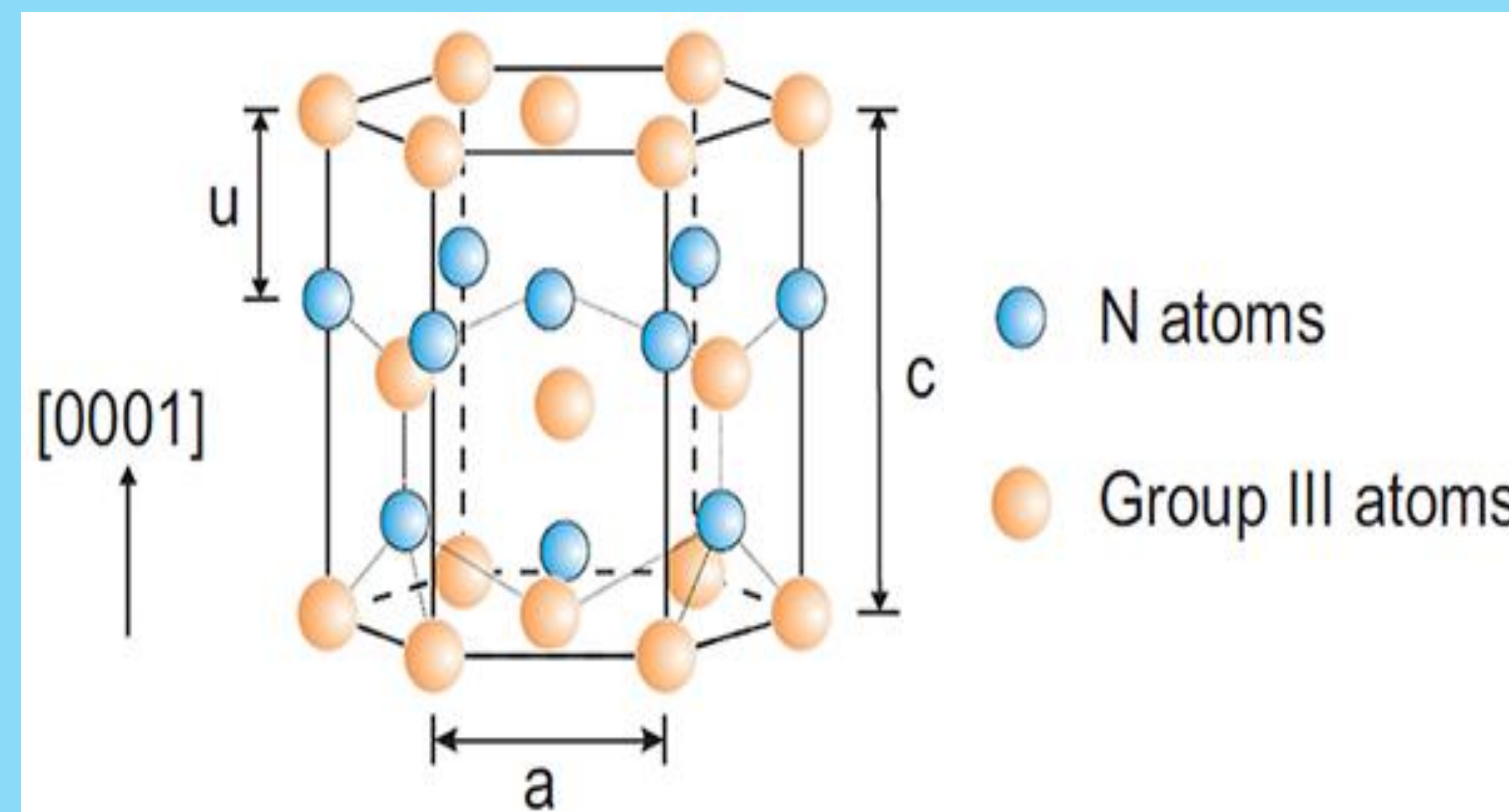


Fig. 2: Molecular structure of gallium - nitride

Gan in the automotive industry

The advantages of GaN Technology consist in smaller and more efficient power systems developed with reduced costs due to the property of GaN transistors to offer lower switching loss, faster-switching speeds, increased power density, and improved thermal budgets.

The most important components of the propulsion system based on GaN technology, which play an important role in the design of electric or hybrid vehicles are: Onboard Charger, DC-DC Converter, Traction Inverter.

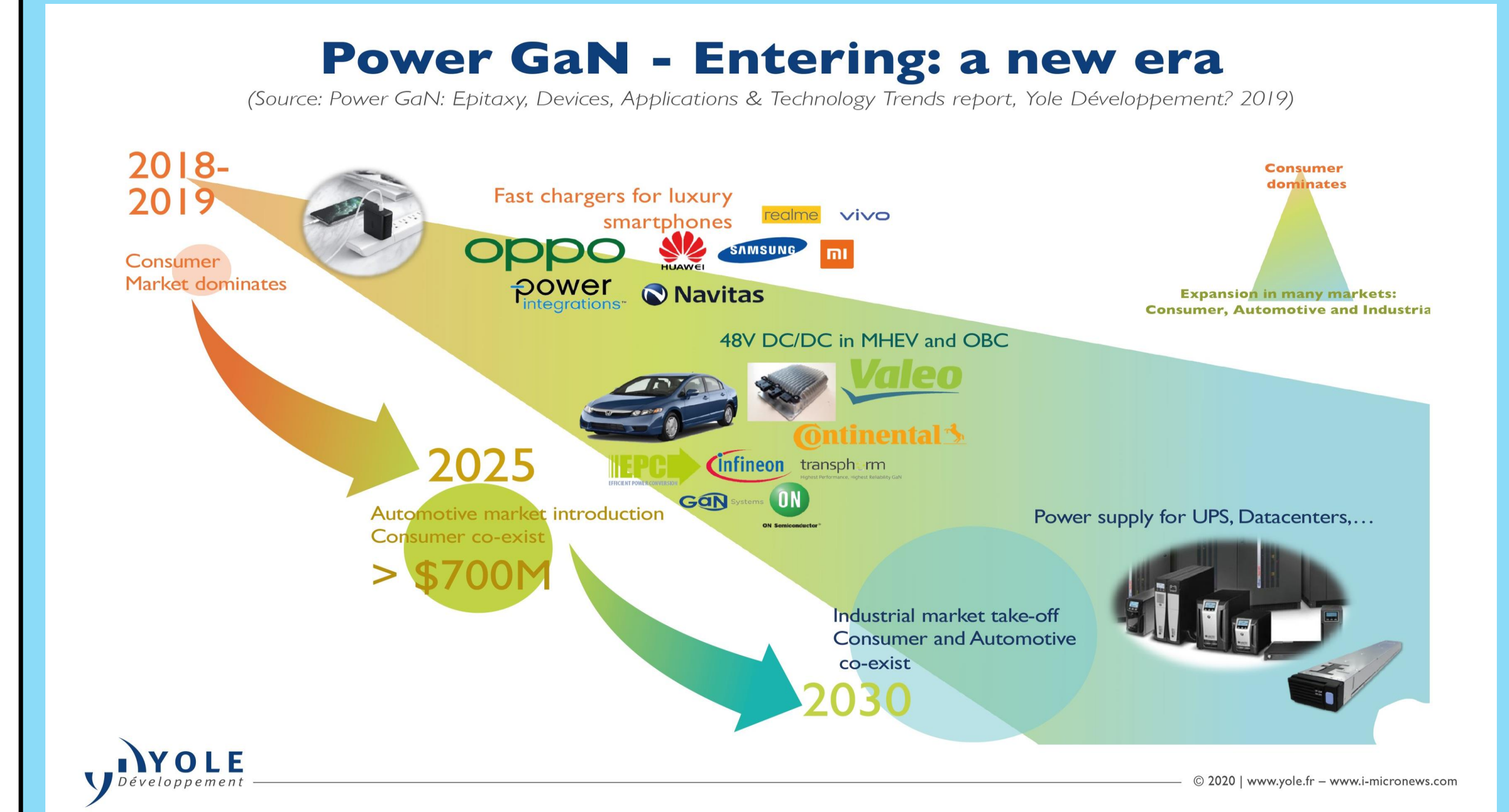


Fig. 3: Power GaN and SiC: Entering a New Era

Conclusion

- Devices based on GaN will revolutionize the propulsion system for electric vehicles.
- GaN transistors are suitable for high frequency, high voltage, high temperature and high efficiency applications.

References

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