

# Semiconductor

**R&D Project Title : Creation of ultra-wideband virtual impedance circuit for highly reliable and high-power density power converter**

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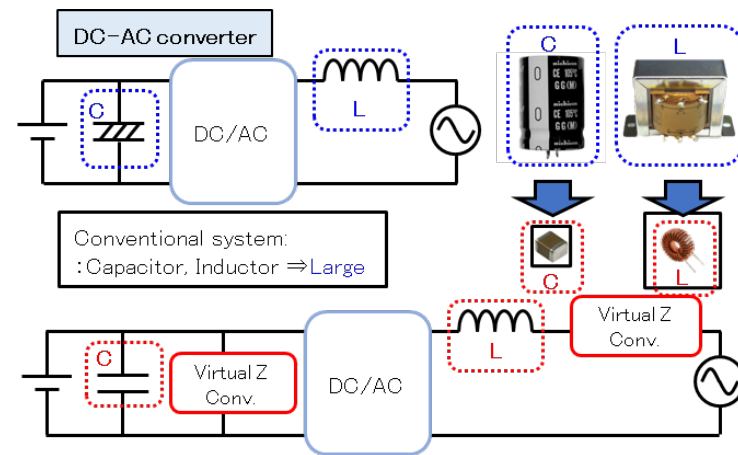


## Summary :

AC-DC power conversion circuits have some problems, such as bulky passive components (capacitors, inductors) and shortened lifetime due to large electrolytic capacitors, which decrease reliability (especially in single-phase AC input). Therefore, this research creates an "ultra-wideband virtual impedance circuit" to increase efficiency, power density, and reliability. The ultra-wideband virtual impedance circuit is an entirely new concept that combines passive elements and switching technology. The switching technology is used to break the limitations of conventional passive components. As a result, it is possible to miniaturize passive components without relying solely on material properties and to realize passive component parameters that can be optimally adjusted according to operating conditions and loads.

For the contribution of carbon neutral, this technology will be applied to grid interconnection systems, energy storage systems, industrial motor drives, semiconductor manufacturing equipment, and so on. Moreover, this technology will contribute to carbon neutral from the following approaches;

- 1) Reduction of energy loss through higher efficiency,
- 2) Expanding the applications and usage of power electronics systems by increasing power density,
- 3) Increased operating time due to improved reliability.



Proposal: **Ultra-wideband virtual impedance circuit**  
 $\Rightarrow$  Dynamic Reactance opt., Drastic downsizing of pass. comp.

