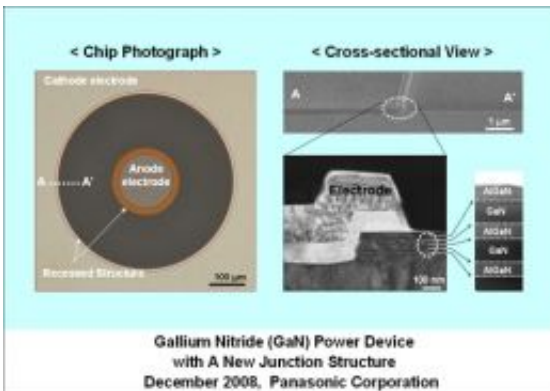


# Panasonic Develops A Gallium Nitride (GaN) Power Device with A New Junction Structure

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Panasonic today announced the development of a Gallium Nitride (GaN)-based diode with a new junction structure called "Natural Super Junction". The new GaN diode with low operating loss is applicable to a variety of consumer and industrial power switching systems.

The new junction structure consists of multilayered GaN-based semiconductor thin films with different compositions of which each interface produces fixed positive and negative charges by the material's unique polarization. The layered structure acts as an insulator at the reverse bias owing to the complete balancing of the fixed charges so that the breakdown voltage can be increased just by extension of the distance between the two electrodes.

The increase of the number of the multilayer resulting in the increase of the current channels effectively reduces the on-state resistances as well. The proposed device structure is similar to super junction of Si devices in which p-type and n-type layers are alternately stacked. The new junction structure does not require any precise control of the doping concentration in the layers as is necessary for the Si super junction. The high breakdown voltages can be achieved taking advantage of naturally formed fixed charges and thus it can be called natural super junction.

The new GaN-based diode exhibits high breakdown voltage of 9400 V with low on-state resistance of  $52 \text{ m}\Omega\text{cm}^2$ , which reaches the predicted limitation by GaN-based semiconductors for the first time. It is also noted that Panasonic's proprietary formation technique of the electrodes over the recessed structure reduces the contact resistance between the electrodes and the current channels, which greatly helps to reduce the on-state resistances.

Applications for one hundred and twenty four domestic and eighty international patents have been filed. These research and development results have been presented at International Electron Devices Meeting 2008, held at San Francisco, U.S. from December 15 to 17, 2008.

Provided by Panasonic

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