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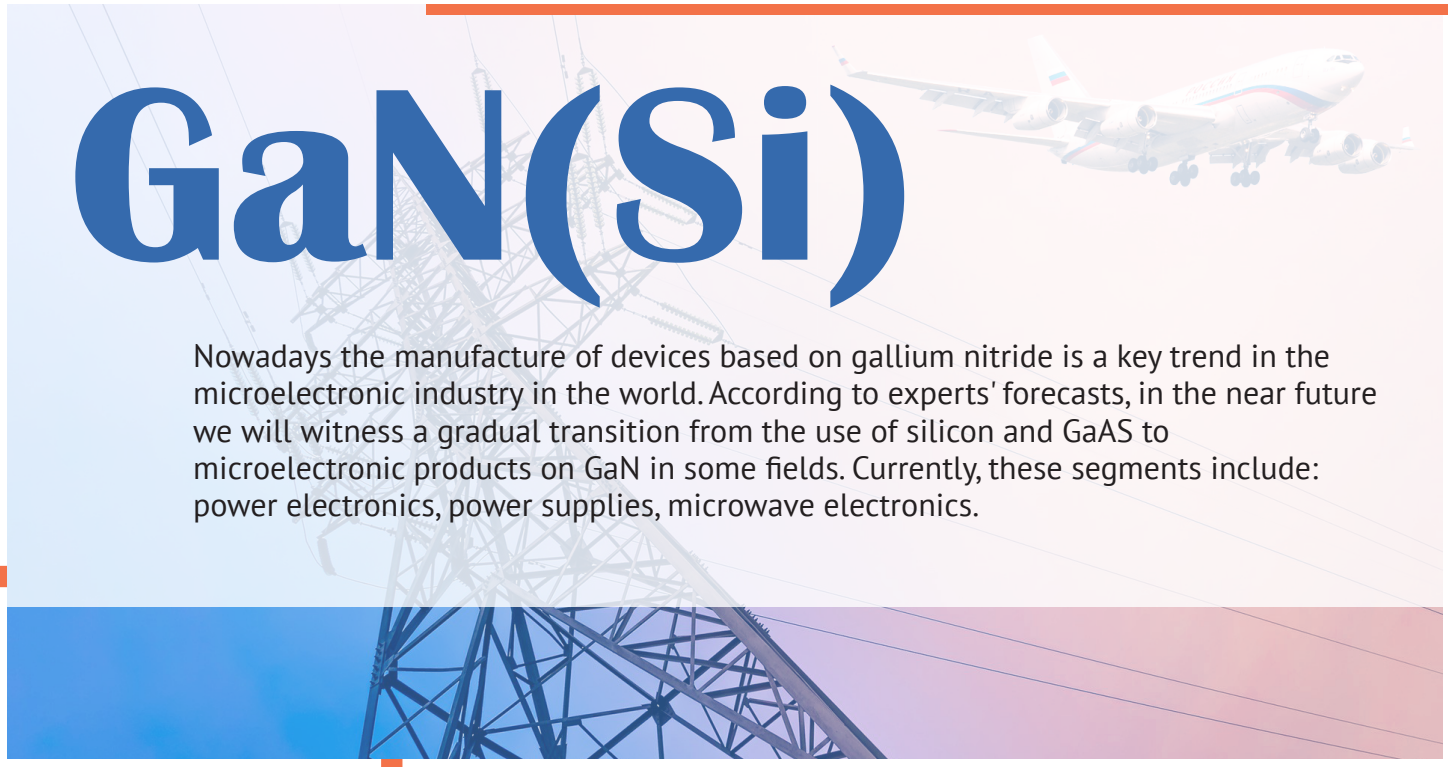
JSC "Zelenograd Nanotechnology Center"
+7 (499) 720-69-44 | sales@zntc.ru
zntc.ru

GaN(Si)



Nowadays the manufacture of devices based on gallium nitride is a key trend in the microelectronic industry in the world. According to experts' forecasts, in the near future we will witness a gradual transition from the use of silicon and GaAS to microelectronic products on GaN in some fields. Currently, these segments include: power electronics, power supplies, microwave electronics.

GaN transistors can significantly improve the characteristics of the devices.

Since the gallium nitride structure is a semiconductor with a wide bandgap, it is possible to use an increased supply voltage and achieve higher power density.

The higher power density results in a lower capacitance per unit of output power, which means that transistors with more power at a comparable frequency range can be manufactured.

Key benefits of GaN transistors

- work at high temperatures
- work at high voltage
- work at very high frequency
- work in radiation conditions

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Obtained samples of electronics on GaN(Si)

HEMT and MISHEMT transistors with T-gate > 0.1 μm, breakdown voltage >250V, output power from 10W/mm (150W for amplifier).

Functional range of electronic components and transceiver modules with the following characteristics: operating frequency up to 50 GHz, overall dimensions no more than 4x4x 12mm, output power 1-2W.

Microwave electronics

Parameter	Microwave transistor
Process	GaNSi0,25
Substrate	Si
Heterostructure	epitaxy
Substrate thickness	100 um
Pinholes to the source	yes
Gate length Lg	0,25 um
Gain cutoff frequency Ft (@20V)	36 GHz
Saturation current Ids (saturation)	1000 mA/mm
Drain current (@ gmmax)	520 mA/mm
Slope gmmax (@ Idsmax)	280 mS/mm
Breakdown voltage Vbds	>100 V
Gain (@10GHz)	14 dB
Output power (@20V)	3 W/mm

Advantages

High efficiency

High power density

Low capacity

Wide Bandwidth

Small dimensions

Areas of applications

Cellular - base stations 4G / LTE / 5G

Satellite connection

Microwave energy (alternative to magnetrons)

Wired broadband

Wireless communications

Radar / avionics

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Power electronics

Parameter	Power transistor
Process	GaNSi0.8
Substrate	Si
Heterostructure	epitaxy
Substrate thickness	100um
Pinholes to the source	yes
Gate length Lg Lg	0.8um
Gain cutoff frequency Ft (@20V)	
Saturation current Ids (saturation)	500mA/mm
Drain current (@ gmmax)	0.5 -20A
Slope gmmax (@ Idsmax))	
Breakdown voltage Vbds	200, 400, 600V
Gain (@10GHz)	
Output power (@20V)	

Advantages

High current density

High electrical strength

High switching frequency

High operating temperature

Minimum noise level

Areas of applications

Power supply

Uninterruptible power supplies

Electric motors (electric vehicles, industry)

Equipment for servers and data centers

Solar energy

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JSC TTK together with National Research University of Electronic Technology develop basic technologies and routes for the manufacture of GaN electronics and modern components for power electronics and communication systems.

The implementation of the project will directly or indirectly solve the main priority tasks established by the Science and Technology Strategy development of the Russian Federation.

Zelenograd nanotechnology center is a multifunctional microelectronic complex for the full cycle of development and contract manufacturing of microelectronics and microsystems products with a set of CMOS, MEMS, technologies, which provides the necessary conditions for the manufacture of a wide range of civil products.

Our advantages:

We provide a full cycle of development and manufacture of electronic component base, including GaN(Si).

We established partnership with leading universities and electronics enterprises of the Russian Federation

Our production capacities allow to manufacture up to 2500 wafers per year

Our IC manufacturing has an isolated technological line for GaN(Si)-based devices

Our assembly production has modern equipment, including sealing in plastic packages

Our technological process is focused on the device manufacturing on 150 mm wafers

The personnel of the company is highly qualified