

Customised HEMT epitaxial structures

The recommended epitaxial structures and their specifications:

Si ₃ N ₄	cap – 2-3nm thick
AlGa _N	spacer – 20nm thick, Al _x Ga _{1-x} N (x=20%)
AlN	spacer – 1.0-1.5nm thick
Ga _N	2 DEG GaN channel 2µm GaN buffer
substrate	substrates

Epitaxy on the substrate: high resistivity C compensated GaN 2µm thick and on top of that undoped high mobility GaN, 2DEG channel of 0.1µm.

An example of HEMT parameters depending on the substrate used:

Substrate used:	sapphire	sapphire with passivation Si ₃ N ₄ (40nm)	4H-SiC (n-type)	Si(111) high resistivity > 300 [ohm*cm]
CC Hall measurement	1.64·10 ¹³ cm ⁻³	1.8·10 ¹³ cm ⁻³	1.26·10 ¹³ cm ⁻³	3.12·10 ¹³ cm ⁻³
CC Hall measure (77K)	1.5·10 ¹³ cm ⁻³	1.53·10 ¹³ cm ⁻³	1.25·10 ¹³ cm ⁻³	1.42·10 ¹³ cm ⁻³
mobility	1390 cm ² /Vs	1082 cm ² /Vs	1283 cm ² /Vs	645 cm ² /Vs
mobility (77K)	3378 cm ² /Vs	3964 cm ² /Vs	4722 cm ² /Vs	2334 cm ² /Vs
resistivity - ρ	277 Ωcm	320 Ωcm	388 Ωcm	309 Ωcm
resistivity - ρ (77K)	123 Ωcm	103 Ωcm	106 Ωcm	188 Ωcm

All above data obtained from 2" wafer structures

New: RF HEMTs on n-type/SI SiC for Power Amplifiers and Low Noise Amplifiers:

- no parasitic shunt,
- excellent uniformity of I-V characteristics (DC&RF characteristics on FAT FET transistors),
- average mobility 1900cm²/Vsec in the channel,
- transconductance gm – 230mS/mm in the channel,
- cut-off frequency for 1µm device f_T ~ 60GHz,

HEMT structure used: n-type SiC substrate with an AlN buffer 60-90nm, on top of that GaN buffer 2µm, 2DEG GaN channel, AlGa_N spacer – 30nm, Al=30%, undoped GaN cap 2-3nm.

Please inquire about our homoepitaxial HEMTs on 1" bulk GaN SI

GaN SI substrate features:

- dimension – 1" diameter
- resistivity – 10⁹ - 10¹² Ωcm
- thickness – 350µm
- total thickness variation – less than 40µm
- bow – less than 10µm
- FWHM of X-ray rocking curve – 20 arcsec
- dislocation density < 10⁵ cm⁻²

