

## Technical Datasheet

# Graphene Field-Effect Transistor Chip: S-20

### General Description

The GFET S-20 chip from Graphenea is designed for measurements in liquid medium. The new version provides 12 graphene devices, with encapsulation on the metal pads to avoid degradation and reduce leakage currents; the probe pads are located near the periphery of the chip. It also includes a non-encapsulated electrode at the center of the chip, which allows liquid gating without the need of an external gate electrode (such as Ag/AgCl probes). This device architecture enhances signal-to-noise ratio and reduces parasitics, and allows for multiplexing of signals within the same chip.

#### Features

- State-of-the-art GFETs utilizing Graphenea's established consistently high-quality graphene
- Semiencapsulated geometry + central gate electrode for measurements in liquid environments.
- Perfect platform device for new sensor research and development
- 12 individual GFETs per chip. Multiplexing.
- Mobilities typically in excess of 1000 cm<sup>2</sup>/V·s

#### Applications

- Graphene device research
- Biosensors
- Chemical sensors
- Bioelectronics

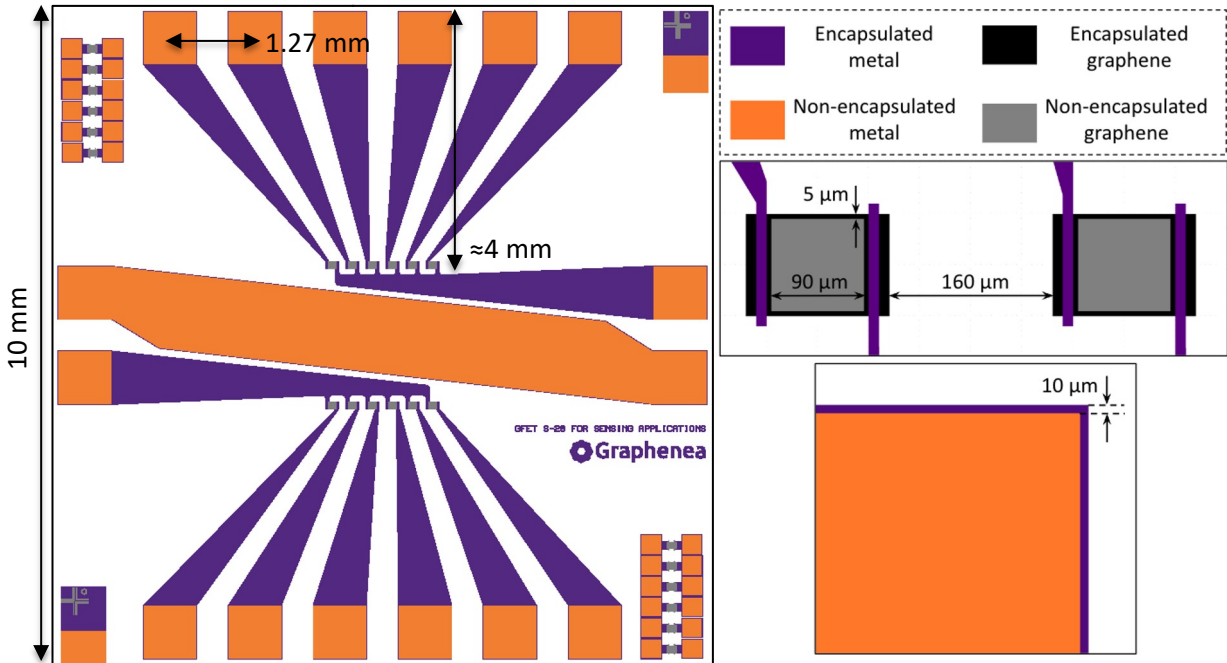
### Typical Specifications

Chip dimensions	10 mm x 10 mm
Chip thickness	675 μm
Number of GFETs per chip	12
Gate Oxide thickness	90 nm
Gate Oxide material	SiO <sub>2</sub>
Resistivity of substrate	1-10 Ω·cm
Metallization	Au contacts
Encapsulation	50 nm Al <sub>2</sub> O <sub>3</sub>
Graphene field-effect mobility (back gating)	>1000 cm <sup>2</sup> /V·s
Dirac point (liquid gating in PBS)	<1 V
Number of graphene channels with integrity	>75 %

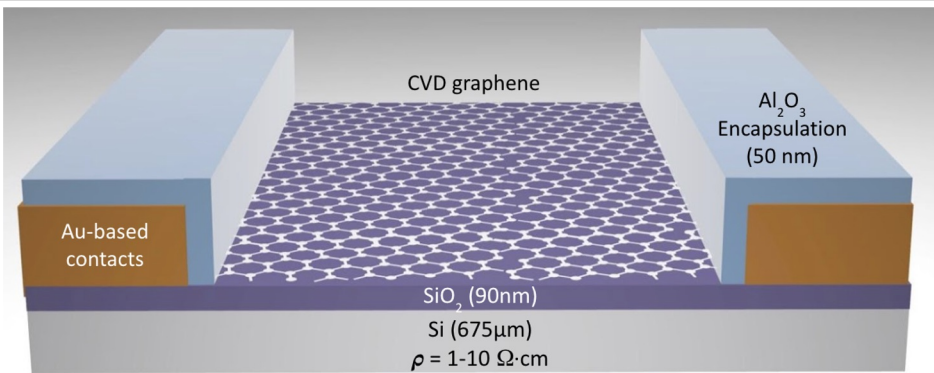
### Absolute Maximum Ratings

Maximum gate-source voltage (back gating)	± 50V
Maximum gate-source voltage (liquid gating in PBS)	± 2V
Maximum temperature rating	150 °C
Maximum drain-source current density	10 <sup>7</sup> A·cm <sup>-2</sup>

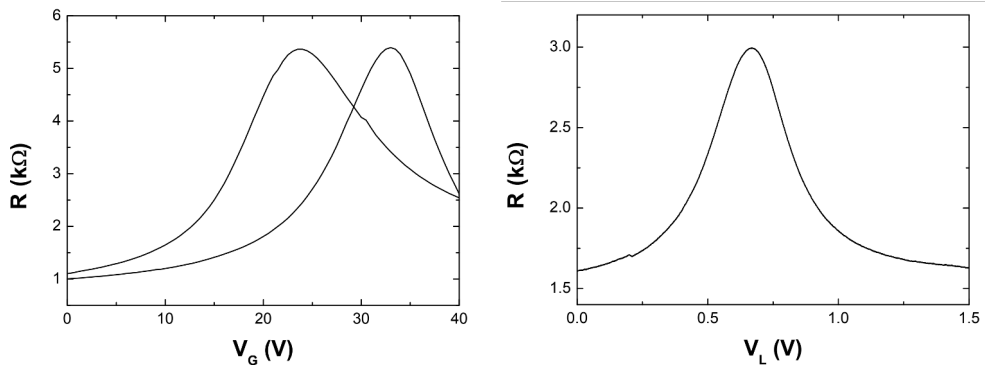
### GFET-S20 Layout



### Device cross-section



### Typical characteristics



Left: Transfer curve under back gating measured at source-drain voltage of 20mV at room temperature and vacuum conditions. Right: Transfer curve under liquid gating through Phosphate Buffered Saline (PBS, pH=7.3), using the on-chip electrode as gate electrode.