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GrFET-101: Technical Datasheet

GrFET-101 is a printed and flexible graphene FET. This FET is specifically designed for various sensing applications. The large channel of this FET is suitable for functionalization and compatible for different bio-sensing applications. This is a single FET device on flexible Kapton substrate.

Figure 1: Device Layout

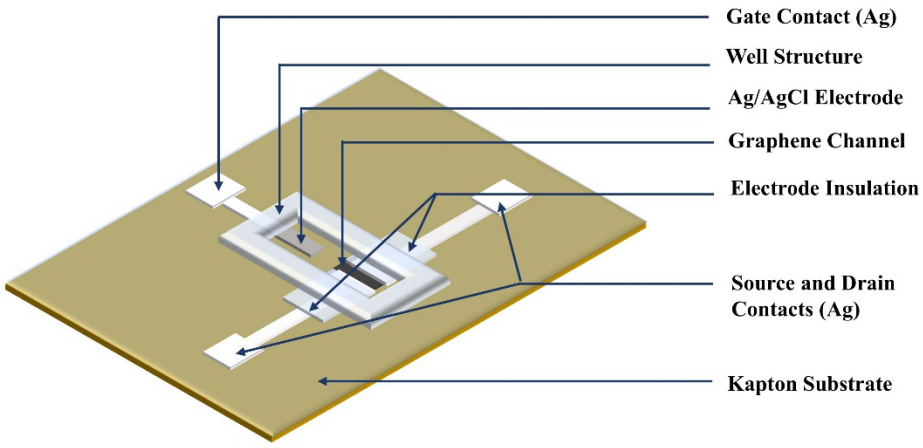
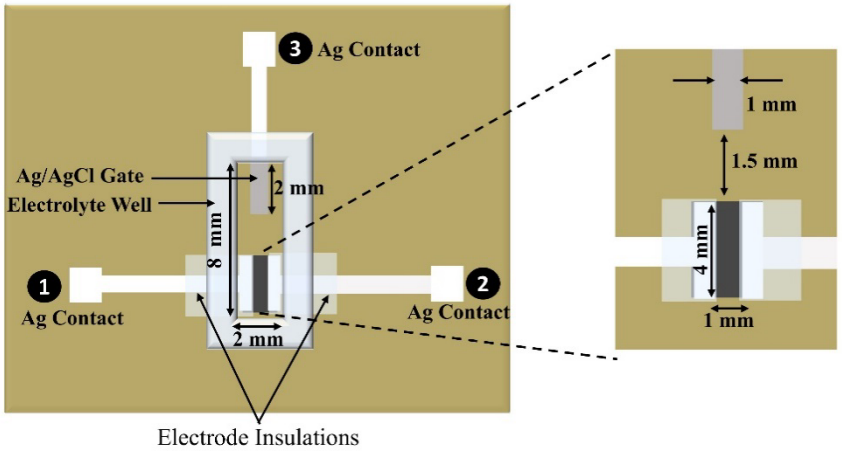


Figure 2: Device Dimensions



1 Contact-1
2 Contact-2
3 Contact-3

- Contact-1 and Contact-2 can be used source or drain electrode interchangeably
- Contact-3 is the contact for onboard Ag/AgCl gate electrode

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Typical Device Specifications

Channel length	1 mm
Channel width	4 mm
Channel Resistance	2 KΩ – 10 KΩ
Electrodes	Silver (Ag) contacts
Source and Drain insulation	Polymer
Dirac Point (with electrolyte gating with 1×PBS (Phosphate Buffer Solution))	< 1 V

Device Ratings

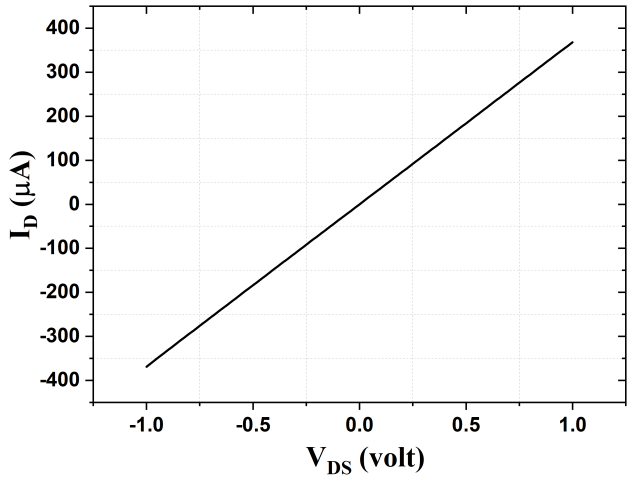
Maximum Gate-Source Voltage (electrolyte gating with 1×PBS)	± 1.2 V
Operating Temperature	25 °C – 45 °C

Electrical Measurement Configuration:

1. Two-probe measurements:
    - Apply Drain-Source voltage V_{DS} at electrode-1 and electrode-2.
    - Due to V_{DS}, drain current I_D can be measured using an ammeter. I_D can be varied by varying V_{DS}.

A typical channel characteristic measured in a two-probe measurement (with an open gate electrode) is shown in Figure 3.

Figure 3: Channel I~V Characteristics.



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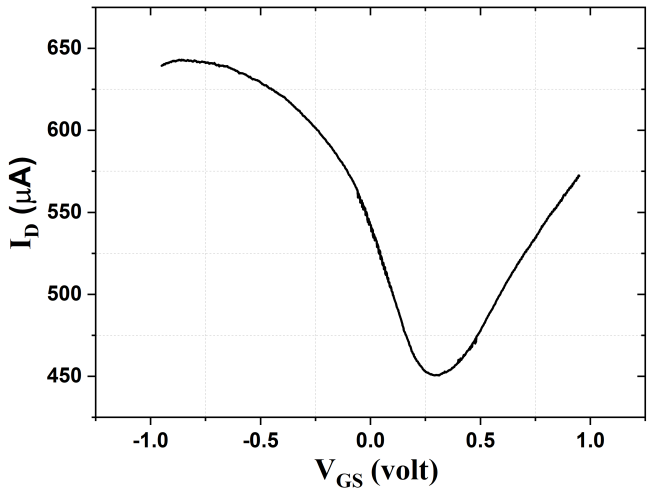
2. Three-probe measurements:

(i) With the onboard Ag/AgCl gate electrode for electrolyte gating

- Fill the PDMS well Structure with the required electrolyte.
- Apply Drain-Source voltage V_{DS} at electrode-1 and electrode-2.
- Apply Gate-Source voltage V_{GS} at electrode-3
- With constant V_{DS}, the drain current I_D can be controlled by varying V_{GS} (using electrolyte gating with the onboard Ag/AgCl electrode.)

Transfer Characteristics of the Electrolyte Gated Gr-FET with 1×PBS using the onboard Ag/AgCl gate is shown in Figure 4.

Figure 4: Transfer Characteristics with V_{DS} = 1 V
(Electrolyte Gating with 1×PBS using the onboard Ag/AgCl gate)



(ii) With an external gate electrode for electrolyte gating

- Fill the PDMS well Structure with the required electrolyte.
- Apply Gate-Source voltage V_{GS} to an external reference electrode immersed in the electrolyte solution covering the exposed graphene channel.