

Description

The Paragraf GFET-PV01 is an electrolyte-gated field-effect transistor (FET) mass-produced with a proprietary technique for depositing graphene directly on the device substrate. This produces graphene channels free from polymer residues, foreign molecules or other defects.

The GFET-PV01 is designed with an in-plane electrode to gate the transistor channel with three graphene channels equidistant from the central gate electrode. The design enables a homogeneous electric field during operation. An external gate electrode (not supplied) can also be used as required by the test application.

The GFET-PV01 is produced for developing sensing applications with an epoxy encapsulation layer allowing consistent liquid handling during sensor modification and test. In addition, the three channels are positioned to enable reliable manual or automated functionalisation of each graphene channel independently for multiplexing and/or internal referencing. The device is compatible with readily available data acquisition systems.

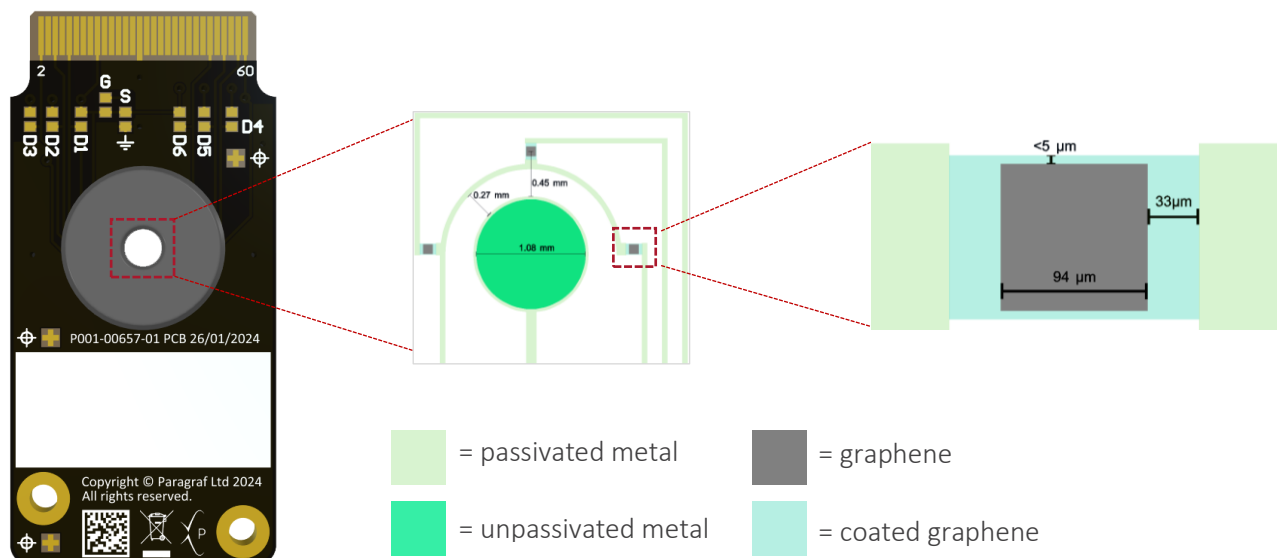


Figure 1. GFET-PV01 sensor layout

Technical Specifications

Mechanical (W x D x H)	24 x 50 x 2.7 mm
No. of channels	3
In-plane gate material	Thin film metal
Chip Passivation	Metal oxide
Dirac Point (testing buffer salinity 19 mM, pH=7.1)	500mV \pm 200mV
Transconductance	>1.5 mS \cdot sq/V
Channel Resistance	<3 kOhm
Gate voltage range stability (V_G)	-500mV to +900mV
Maximum Operating Voltage	\pm 5V AC/DC
Maximum Current	10 mA
Recommended Operating Voltage	\pm 1V AC/DC
Recommended Operating Current	1 mA
Recommended operating temperature	20°C \pm 5°C
Maximum storage temperature	Up to 50°C
Minimum storage temperature	4°C
Recommended storage temperature	20°C \pm 5°C

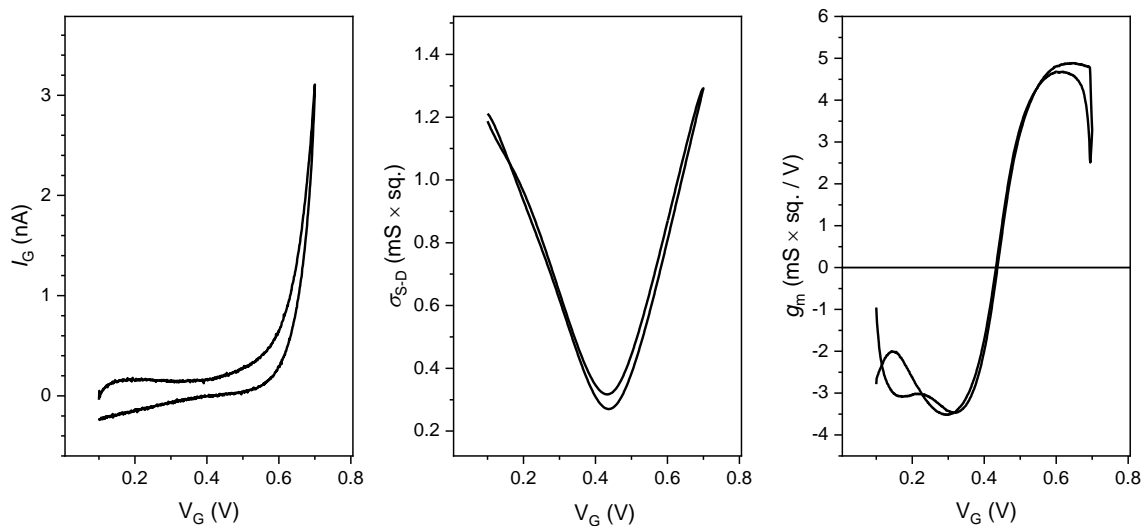


Figure 2. GFET-PV01 sensor performance (from left to right): I_G current (leakage current), transfer characteristic, transconductance.

Operation

The GFET-PV01 is designed to be connected via the 'Plug-in GFET' (PiG) breakout board (available from Paragraf). Plug in the GFET-PV01 into the edge connector socket on the PiG and use the supplied M2.5 screws to secure the board in place. Please refer to the PiG datasheet for additional information. Use the PiG screw terminal to connect the GFET-PV01 to your data acquisition system of choice.

Below is a typical schematic on how to operate a GFET-PV01 graphene channel. To operate the transistor as an electrolyte gated GFET, apply a buffered electrolyte within the inner cavity of the epoxy encapsulation layer. Pre-incubate sensors with the measurement buffer solution for an equilibration time not lower than 10 minutes. Recommended applied voltage are $V_{S-D} = 20$ to 100mV and $V_G = +200$ mV to +800mV, scan rate 45 mV/sec. Recommended supplied $I_{S-D} = 100 \mu\text{A}$.

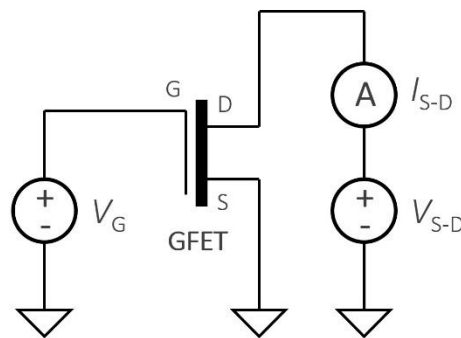
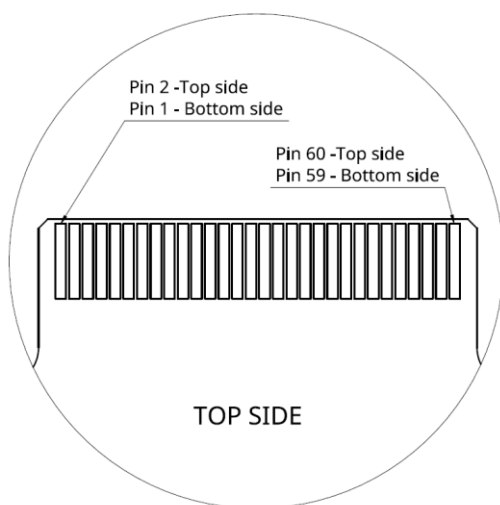


Figure 2. Typical test circuit for an electrolyte gated graphene FET

Please refer to the Terms of Sale (GFET) before use of this product:
<https://store.paragraf.com/policies/terms-of-service>

GFET-PV01 pinout

The GFET-PV01 is designed to connect to the PiG breakout board via the edge connector socket (SAMTEC MEC6-130-02-L-D-RA1).



SIGNAL	PIN NUMBER
DRAIN 1 (D1)	10
DRAIN 2 (D2)	6
DRAIN 3 (D3)	2
DRAIN 4 (NA)	58
DRAIN 5 (NA)	54
DRAIN 6 (NA)	50
GND (\neq)	30
SOURCE (SO)	18
GATE (GA)	25
GND (\neq)	31
GATE (GA)	60



Cleaning and disposal of the GFET-PV01

The GFET-PV01 is a single-use item and is not designed to be re-used. Cleaning may be required prior to disposal, depending on substances employed during usage.

Reasonably Foreseeable Misuse

The equipment is NOT designed for any of the following environments:

- Non-industrial or non-research environments.
- Outdoors.
- Wet conditions (excluding the controlled application of electrolyte).
- Used in explosive or combustible atmospheres.

Customers should perform their own risk assessment before carrying out any work with this product.

WEEE Regulation Requirement

Disposal of the GFET-PV01 requires that a separate collection for waste electric and electronic equipment (WEEE) is required. Check local regulations regarding WEEE and if needed contact a WEEE waste removal firm or return to Manufacturer for disposal.

In the case of contact with hazardous substances, follow the control measures identified in the user's risk assessment for that substance in line with the substance safety data sheet (SDS). Where the GFET-PV01 is not contaminated, follow the WEEE disposal requirements above.

Symbol



Description

Do not dispose of this product as general waste.

 **CAUTION**
CAUTION: RISK OF ELECTROSTATIC HAZARD TO EQUIPMENT.

- Excessive overvoltage during an ESD strike, can cause permanent damage to the product and connected equipment. Standard ESD precautions should be implemented and maintained when using this product.

 **CAUTION**
CAUTION: RISK OF CONTACT WITH HAZARDOUS SUBSTANCE.

- To prevent injury, ensure a risk assessment is made for the full measurement system including the GFET-PV01 and PiG, covering the interaction between the electrolyte employed by the user and the GFET-PV01. Use suitable PPE.

For further information on how to order accessories for use with your GFET-PV01 and additional units, please contact us:



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