
Frequent Asked Questions

Reference electrode

D+T Microelectronica ISFETs have not an integrated reference electrode. The client have to purchase one for doing the measurements, like saturated Calomel Electrode (SCE, with a KCl solution) or Silver/Silver Chloride electrode (Ag/AgCl, in a saturated KCl solution). The last is the most common. The client can purchase them from companies like ORION, Metrohm, Hanna Instruments.

Electronics for ISFET

A signal amplifier circuit (ISFETmeter) would be required for doing the measurements (see description below). The company can provide this electronic.

Sensor packaging

We provide sensors for laboratory use mounted on a probe stick (see size specifications below). This configuration allows immersing the ISFET in a solution like a standard electrode.

Applications

ISFETs only can be used for laboratory applications. If other applications are considered, please ask the technical department.

Lifetime of ISFETs and CHEMFETs

The lifetime of ISFETs measured under laboratory conditions in a pH 7 buffer solution is around 8 months. The lifetime of CHEMFETs under laboratory conditions is around 3 months.

The lifetime of these sensors under different conditions than laboratory will be always lower.

Bare chips ISFETs

We usually provide chips encapsulated and tested. If the client is interested on bare chips the company is not able to perform all the required tests and therefore it cannot guarantee their functionality. The processes of wire bonding and encapsulation are carried out with procedures developed in the IMB-CNM using a Know-How gained during many years of experience, thus assuring the good performance of the devices. If the packaging is produced out of our process, D+T Microelectronica will not be responsible of the final results.

The company is open to develop particular packaging's according to specifications (size, materials...) and application under a development contract.

Bare chips CHEMFETs

D+T Microelectronica cannot sell bare CHEMFETs. The deposition of the membrane is carried out once the device is encapsulated and tested.

There are ISFETs sensitive to electrostatic discharge?

ISFET sensors being microelectronic devices may be subjected to damage by static electricity; therefore they must be handled by a qualified personal and with subsequent care. Some additional information on this can be found in the attached file *Electrostatic discharge sensitivity tests for ISFETs sensors.pdf*.

Which is the general circuitry for ISFETs?

Typical measuring set-up for ISFETs is a constant drain current mode presented schematically in Figure 1. The circuit maintains constant drain current through ISFET channel at fixed drain voltage by changing substrate-source polarisation potential versus a reference electrode. This gives a linear response of the output voltage in function of the pH.

For our devices we fix the drain voltage V_D at 0.5 V and the drain current I_D at 100 μ A. The typical reference electrode is a conventional Ag/AgCl electrode filled with 3M KCl solution. If potassium ions may interfere with your measurements, please use double junction reference electrodes filled with an appropriate salt bridge solution (e.g. lithium acetate).

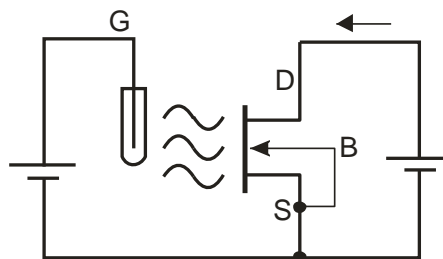


Figure 1. Constant drain current mode circuit

Additional information on ISFET principles and measurement circuitry can be found in the following books:

Bergveld, P. and Sibbald, A., Analytical and biomedical applications of ion-selective field-effect transistors Comprehensive Analytical Chemistry, Eds.: Elsevier Amsterdam-Oxford-New York-Tokyo (1988), 172

Janata, J., Principles of Chemical Sensors in Modern Analytical Chemistry, Eds.: Plenum Press New York, London (1990), 317

Dimensions of the packaged sensors

ISFET sensors are delivered mounted on a probe-stick with a 5-pin connector and encapsulated with a polymer to guarantee the long life-time of the device, as presented in Figure 2. It is highly recommended to avoid touching by hand the contact pins.

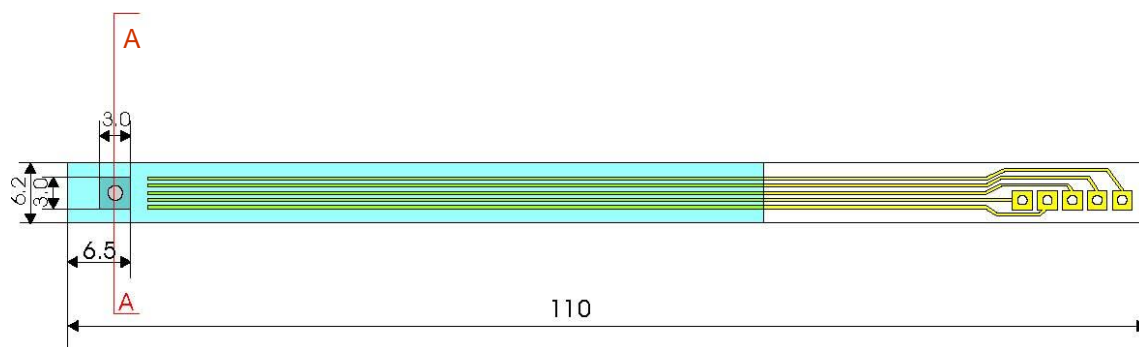


Figure 2. Probe stick used to package the ISFET (All dimensions are in millimeters.)

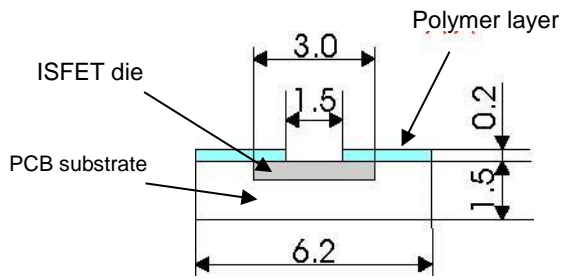


Figure 3. Encapsulated ISFET cross-section A-A of Figure 2.

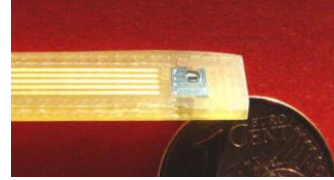


Figure 4. Encapsulated ISFET