

### Additional information for ISFET sensor user

D+T company sells ISFET devices (shown in Figure 1) developed in the Chemical Transducers Group of the IMB-CNM.

**IMPORTANT NOTE:** ISFET sensors being microelectronic devices may be subjected to damage by static electricity, so 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*.

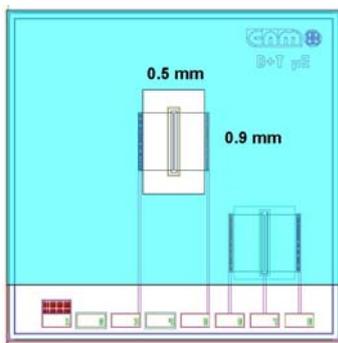


Figure 1. ISFET chip (3 mm x 3 mm)

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

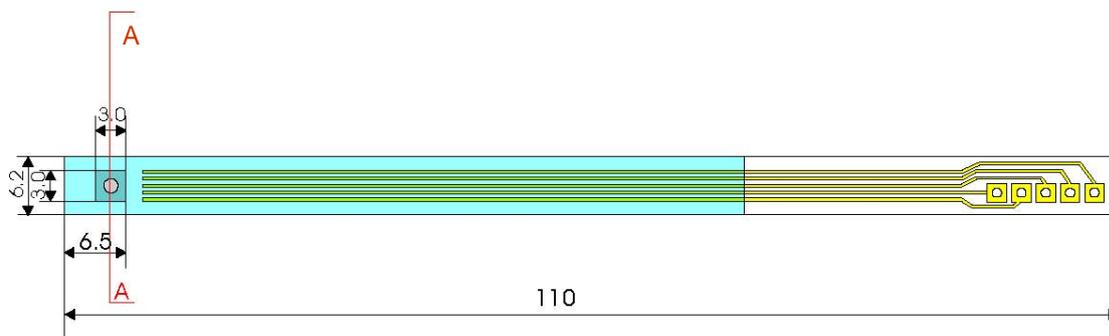


Figure 2. ISFET mounted on a long probe stick (All dimensions are in millimeters.)

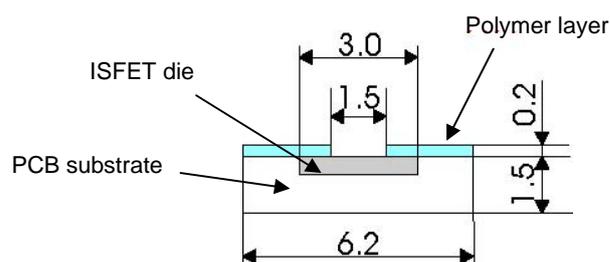
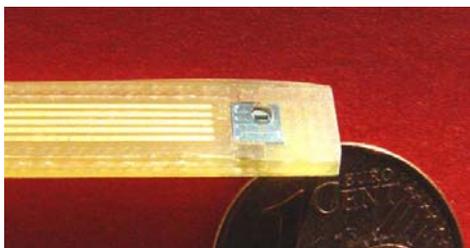


Figure 3. Encapsulated ISFET cross-section A-A of Figure 2.

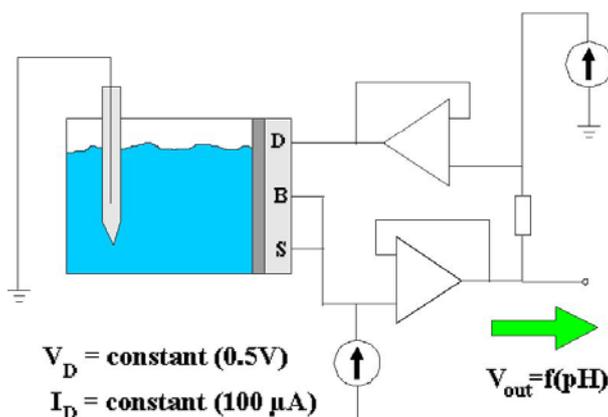


**Figure 4.** Encapsulated ISFET sensor

To work with ISFET devices you also require subsequent electronic modules that we do not provide at the moment. However the circuitry is quite simple and can be made at your site.

Typical measuring set-up for ISFETs is a constant drain current mode presented schematically in Figure 5. 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  $\mu\text{A}$ . 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 5.** Constant drain current mode circuit

Additional information on ISFET principles and measurement circuitry may 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