Ion Sensitive Field-Effect Transistor - ISFET

1. Sensor Specifications

**Physical specification**
- Technology used: 6" planar CMOS process
- Chip dimensions: 6.0 x 2.0 x 0.6 mm
- Gate length: 100 µm
- Gate width: 2,000 µm
- Devices per chip: ISFET + p-n diode
- Sensing membrane: Si$_3$N$_4$ (ISFET) TiO$_2$ (EIS)

**Electrical specification**
- ISFET: V$_d$ = 300 mV, I$_d$ = 25 uA, V$_th$ = 1.0-1.5 V
- p-n diode: I$_{forward}$ = 200 uA

**Chemical specification**
- Sensitivity, S: Si$_3$N$_4$ = 50 mV/pH TiO$_2$ = 58 mV/pH
- Linear range: 1 – 14
- Resolution: 0.02 pH
- Accuracy: 0.01 pH (or 0.1%)
- Response time to pH change: < 1 sec. (90%)
- Operating Temp: 5°C – 100°C
- Stability: 0.1 pH/day (or 1%)

**Temperature coefficient**
- ISFET: -1.76 mV/°C (pH = 7)
- p-n diode: -2.3 mV/°C (pH = 7)

2. ISFET Sensor Advantages:

- Sensor interfaces
- Bio-chemical sensitive FET
- Ultraminiature and low-power sensor Microsystems
- Medical diagnostic, environmental monitoring, and other industrial applications
- Other microfluidic or lab-on-a-chip applications