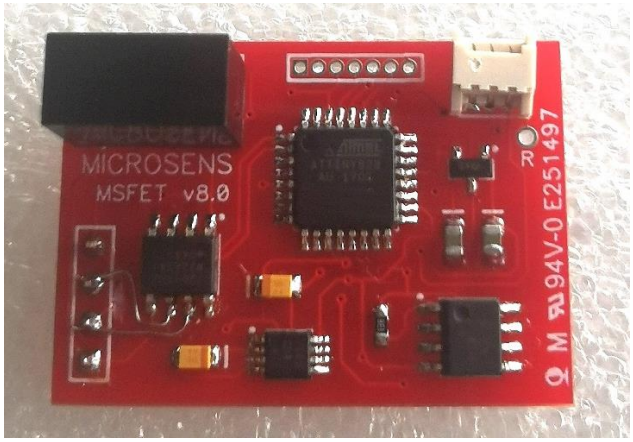
MICROSENS

Product Datasheet

MSFET-DIGITAL

Isolated digital interface for MSFET3330-2, MSFET334x and MSFET3351



Key Features

- Small packaging (25mm x 35mm)
- For integration with Arduino or Raspberry platforms or USB interface
- UART protocol
- Digital sensor output
- Galvanic isolation of in- and outputs
- pH calibration function

Applications

- Laboratory
- Water quality monitoring
- Environment control
- Security and industrial process control

Characteristics

- Temperature range: 0°C … 80°C
- 3.3V or 5V power supply (isolated)
  - Possibility to power via USB bus
- Possibility to power via battery
- pH calibration function
- Digital output of sensor output (raw data) and measured pH
- Data transfer via USART bus (2 wires)

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Technical Specifications

	Min.	Typical	Max.	Unit
Power supply (3.3V)*	3.25	3.3	3.35	V
Power supply (5V)*	4.95	5.0	5.05	V
Input current (3.3V/5V powered)		30		mA
Input current (battery powered, isolated digital output)**		3		mA
Input current (non-isolated 5V input, isolated output)**		3		mA
Sensor output voltage Vsg (J3)	0		4.5	V
ISFET Vds (J1)		0.5		V
ISFET Id (J1)		0.05		mA
UART baudrate		4800		

(*) The digital interface is available in a 3.3V version and in a 5V version. It should be noted, that either version only works at the indicated voltage. The 3.3V version will not work with a 5V power supply and vice versa.
(**) for the battery powered version, the voltage input should be in the range of 7V – 12V. The use of a 9V battery is recommended.

Connections

Pin description (J1):

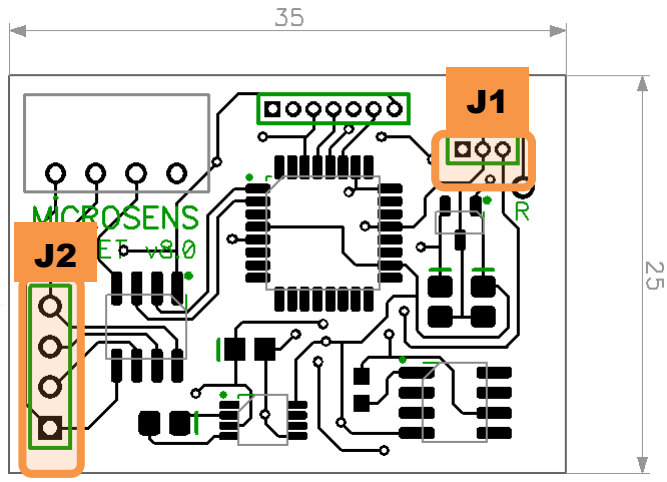
Pin	Description
1 (square)	ISFET source S
2	Reference electrode G
3	ISFET drain D

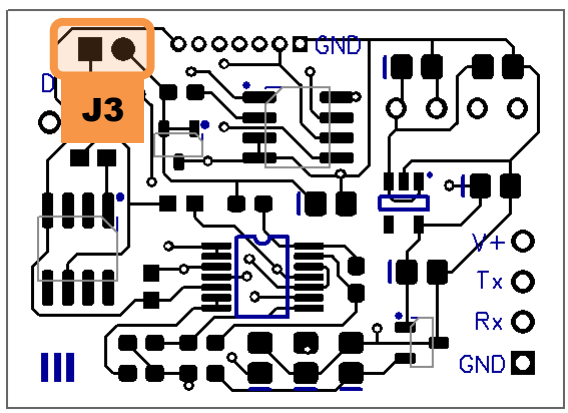
Pin description (J2):

Pin	Description
1 (square)	GND (external)
2	Rx line of UART bus
3	Tx line of UART bus
4	VCC (input voltage) – 3.3V or 5V

Pin description (J3) (backside):

Pin	Description
1	Vsg (internal, no isolation)
2 (square)	GND (internal, no isolation – don't connect to earth ground or external system ground)





Measurement Specifications

	Min.	Typical	Max.	Unit
pH range	1		12	
Resolution:				
Sensor output voltage		0.1		mV
pH		0.02		UpH
Measurement frequency		1		Hz

System commands

Command	Description
data	Obtain data from interface
cal_0	Start calibration
cal_<pH>	Record sensor output for a given pH. The pH value of the current buffer is entered in UpH*100. Example: cal_750 = record the sensor output for the current buffer of pH7.5
param	Print recorded ISFET parameters (V_{offset} [mV] and slope [mV * 100])
off_<V_{offset}>	Enter V_{offset} (e.g. from a previous calibration) into system memory
slp_<slope>	Enter slope (in mV*100) into system memory
dft_<drift>	Enter drift of sensor output voltage into system memory (in mV/day * 100). The pre-programmed default value is 1200 = -1.2mV/day

Commands need to end with “\n”.
Calibration must always start with the most central value of the range of interest.

After a valid command has been received by the interface a response will be sent. Most of the responses will start with “i;”. Only the response to the “data\n” command will start with a “d;” to indicate the sending of measurement data.

During calibration the first cal_<pH> command will lead to an immediate correction of the measurement offset. In consequence the calculated pH should correspond to the calibration pH. The subsequent cal_<pH> commands of the 3-point calibration are used to determine the pH sensitivity and come into effect only at the end of the calibration sequence. Thus a 1-point calibration can be performed by simply using “cal_0” and a single “cal_<pH>” step.

System output structure

Identifier		Content (ASCII string)					
d	;	Sensor output voltage [mV]	;	Calculated pH	;	Checksum (of the previous characters)	\n
i	;	System response					\n

Example for pH calibration (using buffer pH7, pH4 and pH10):

1) Connect ISFET and reference electrode and plunge into pH buffer. Use the buffer which represents the central value of your range of interest (e.g. pH7).
2) Send "**cal_0\n**" to start calibration function.
3) Wait for the sensor output Vsg to stabilize.
4) Send "**cal_700\n**" to record the sensor output at the current buffer (**pH7**). The calculated pH will now be shown as pH 7.0.
5) Change buffers - the next buffer is pH4 – and wait for Vsg to stabilize.
6) Send "**cal_400\n**" to record the sensor output of the current buffer (**pH4**). The calculated pH will not be changed.
7) Change buffers - the next buffer is pH10 – and wait for Vsg to stabilize.
8) Send "**cal_1000\n**" to record the sensor output of the current buffer (**pH10**)
9) The system will determine the calibration parameters and send them as system information as well as writing them to the system memory. The calculated pH should now correspond to the pH of the solution.
10) The sensor is now calibrated and ready for measurement.