

# Saturn Absolute Humidity Sensor AH101-A

## General Description

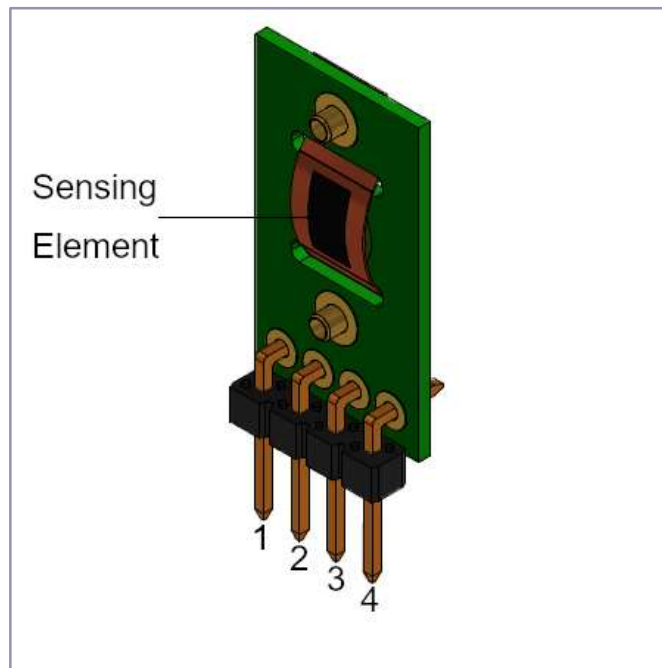
The Saturn AH101-A Absolute Humidity Sensor from Neptune Control features a screen-printed carbon sensor that is very sensitive to moisture. The AH101-A is ideal for industrial applications where low amounts of moisture need to be detected and measured. The sensor comes in an industry standard 4-pin through-hole package.

### Features

- I2C Interface (Up to 400Kbps)
- 16-bit resolution
- 1000 samples per second
- 2.5uA Sleep Current
- Wide voltage range (1.71V – 5.5V)
- -40° C to 85° C rated

### Applications

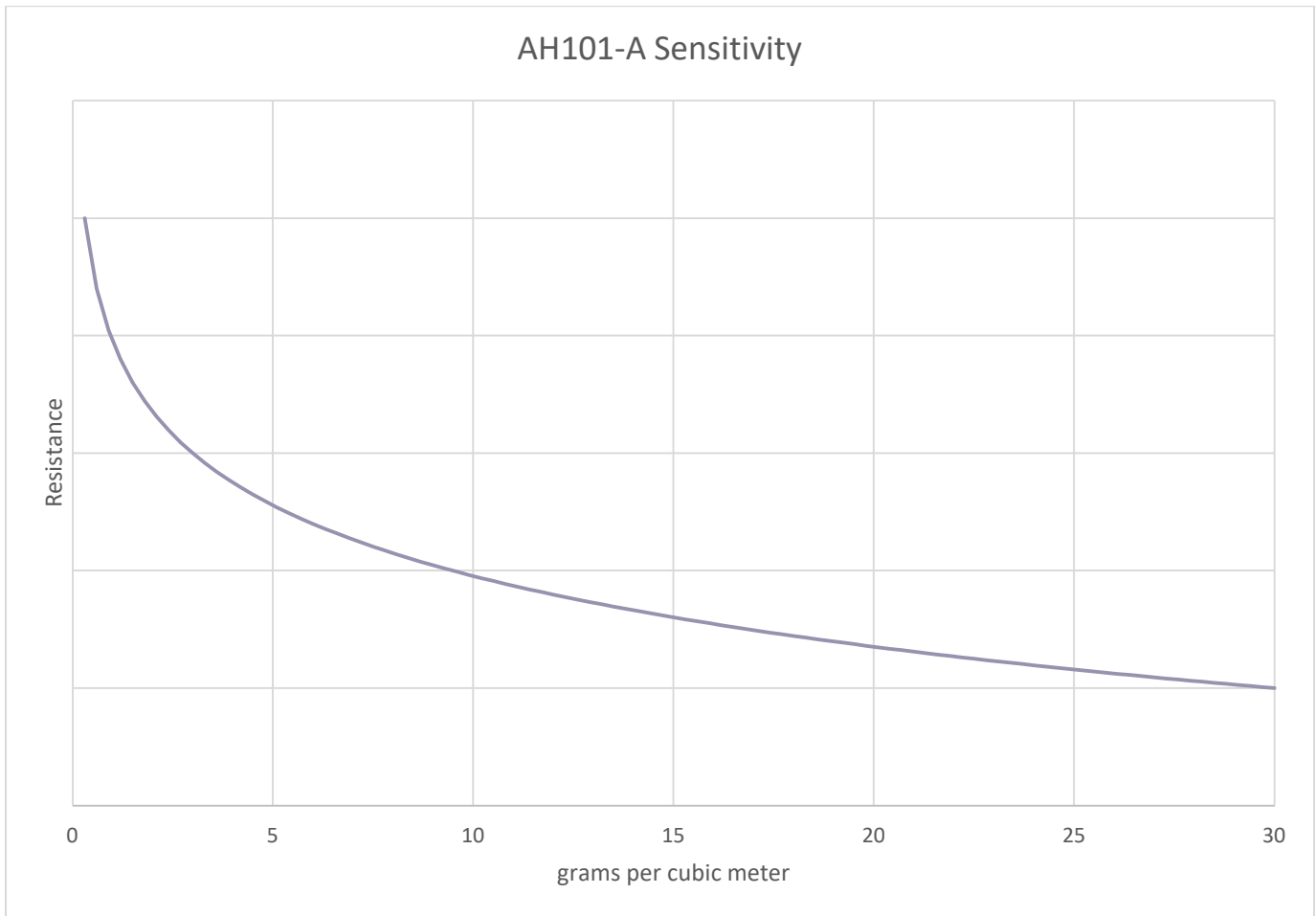
- Dryers/White Goods
- HVAC/Climate Control Systems
- Greenhouse/Horticulture
- Soil Moisture Sensors
- Manufacturing
- Weather Stations



Pin Number	Pin Name	Description
1	VDD	Power Input (1.71V – 5.5V)
2	GND	Ground
3	SCL	I2C Clock Signal
4	SDA	I2C Data Signal

## How It Works

The AH101-A consists of a sensing element made of carbon which is microscopically cracked to make it very sensitive to moisture. The sensing element is far more sensitive at lower humidity than at higher humidity ranges.



The above transfer function shows the relationship between absolute humidity and the resistance change of the sensing element. As conditions dry out the sensor becomes more sensitive and reactive to moisture.

## Electrical Specifications

### Absolute Maximum Ratings

Parameter	Description	Min	Typical	Max	Units
VDD <sub>ABS</sub>	Digital supply relative to VSS	-0.5	-	6	V
VIO <sub>ABS</sub>	IO pin voltage	-0.5	-	VDD+0.5	V
IIO <sub>ABS</sub>	IO pin sink/source current	-25	-	25	mA
ESD_HBM	Electrostatic discharge human body model	2200	-	-	V
ESD_CDM	Electrostatic discharge charged device model	500	-	-	V
ST	Storage Temperature	-60	-	110	°C

### DC Specifications

Parameter	Description	Min	Typical	Max	Units
OT	Operating Temperature	-40	-	85	°C
VDD	Digital supply relative to VSS	1.8	-	5.5	V
IDD <sub>sleep</sub>	Sleep supply current	-	2.5	-	uA
IDD <sub>active</sub>	Active supply current during I2C transfer	-	-	2.0	mA
VIH	Input voltage high threshold	0.7*VDD	-	-	V
VIL	Input voltage low threshold	-	-	0.3*VDD	V

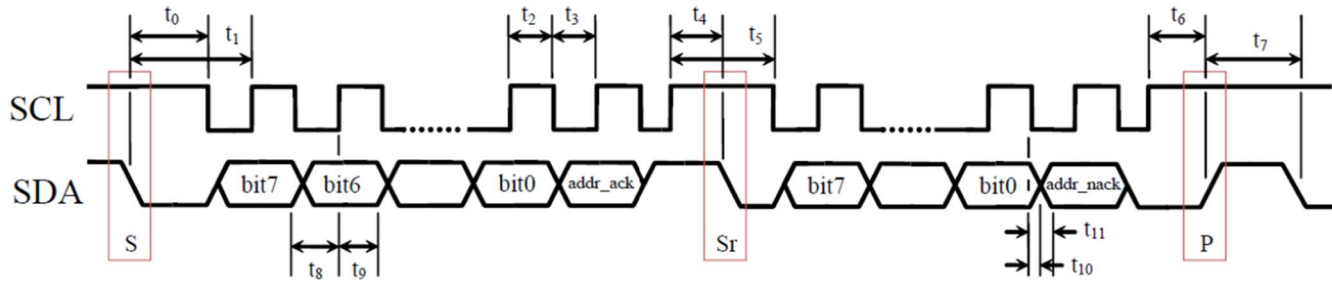
### AC Specifications

Parameter	Description	Min	Typical	Max	Units
F <sub>I2C</sub>	Maximum I2C bit rate	-	-	1	Mbps

### Sensor Specifications

Parameter	Description	Min	Typical	Max	Units
RANGE <sub>AH</sub>	Absolute Humidity Range	0	-	50	g/m <sup>3</sup>
RT <sub>AH</sub>	Absolute Humidity Response Time	-	0.1	-	s
ACC <sub>AH</sub>	Absolute Humidity Accuracy	-	+/- 1	-	g/m <sup>3</sup>
RANGE <sub>T</sub>	Temperature Range	-40	-	85	°C
RT <sub>T</sub>	Temperature Response Time	-	1	-	s
ACC <sub>T</sub>	Temperature Accuracy	-	+/- 1	-	°C

### I2C Timing Diagram



S = Start  
 Sr = Repeated Start  
 P = Stop

### I2C Specifications

Parameter	Description	Min	Typical	Max	Units
$t_0$	SDA low to SCL low transition (Start Event)	50	-	-	ns
$t_1$	SDA low to first SCL rising edge	100	-	-	ns
$t_2$	SCL pulse width: high	100	-	-	ns
$t_3$	SCL pulse width: low	100	-	-	ns
$t_4$	SCL high before SDA falling edge (Repeated Start)	50	-	-	ns
$t_5$	SCL pulse width: high during a Start/Repeated Start or Stop event	100	-	-	ns
$t_6$	SCL high before SDA rising edge (Stop)	50	-	-	ns
$t_7$	SDA pulse width: high	25	-	-	ns
$t_8$	SDA valid to SCL rising edge	50	-	-	ns
$t_9$	SCL rising edge to SDA invalid	50	-	-	ns
$t_{10}$	SCL falling edge to SDA valid	-	-	100	ns
$t_{11}$	SCL falling edge to SDA invalid	0	-	-	ns

## I2C Interface

The Neptune AH101-A Humidity Sensor is easily interfaced with I2C—and without all the complication of reading and writing to registers. The device will hold the clock line low until it has acquired the humidity and temperature values and prepared the output. Then it will release the clock line to allow the data to be transmitted over the bus. A transaction looks like the following.

### I2C Device Address

The I2C 7-bit Device Address is 0x50. The least significant bit of the Device Address is used to differentiate a write (0) or a read (1). Therefore to perform a read the Device Address Byte should be 0xA1.

### I2C Transaction

Start(S)	Device Address + R	Absolute Humidity (MSB)	Absolute Humidity (LSB)	Temperature	Stop(P)
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Any I2C Write is ignored, however any I2C Read will return data in the following format.

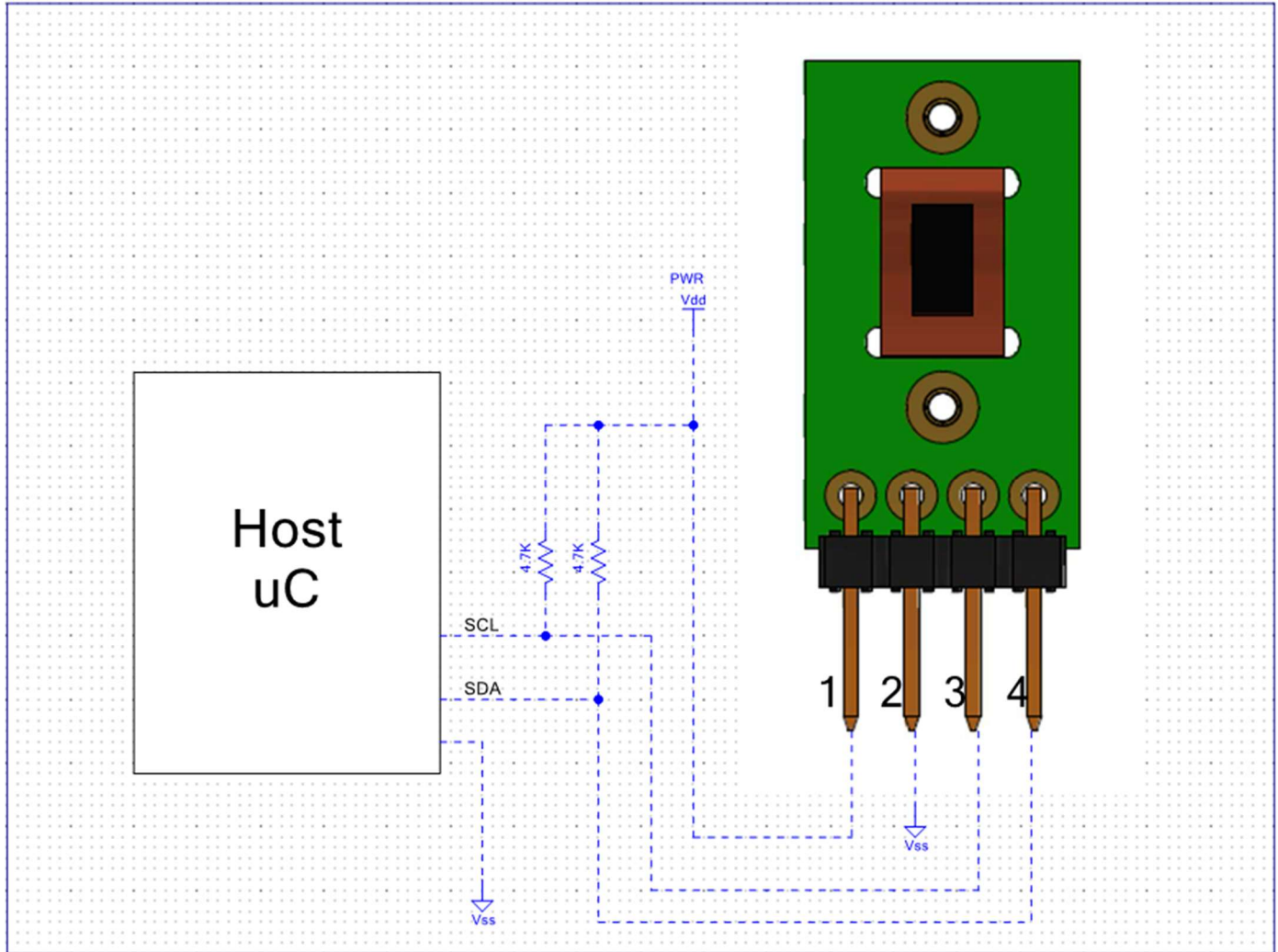
The Absolute Humidity output is a value from 0 to 50 as a 16-bit fixed-point number, the MSB (Most Significant Byte) is an 8-bit integer to the left of the decimal place. The LSB (Least Significant Byte) is an 8-bit fraction to the right of the decimal place.

The equation to convert the 2 bytes into Absolute Humidity (AH) in grams per cubic meter:

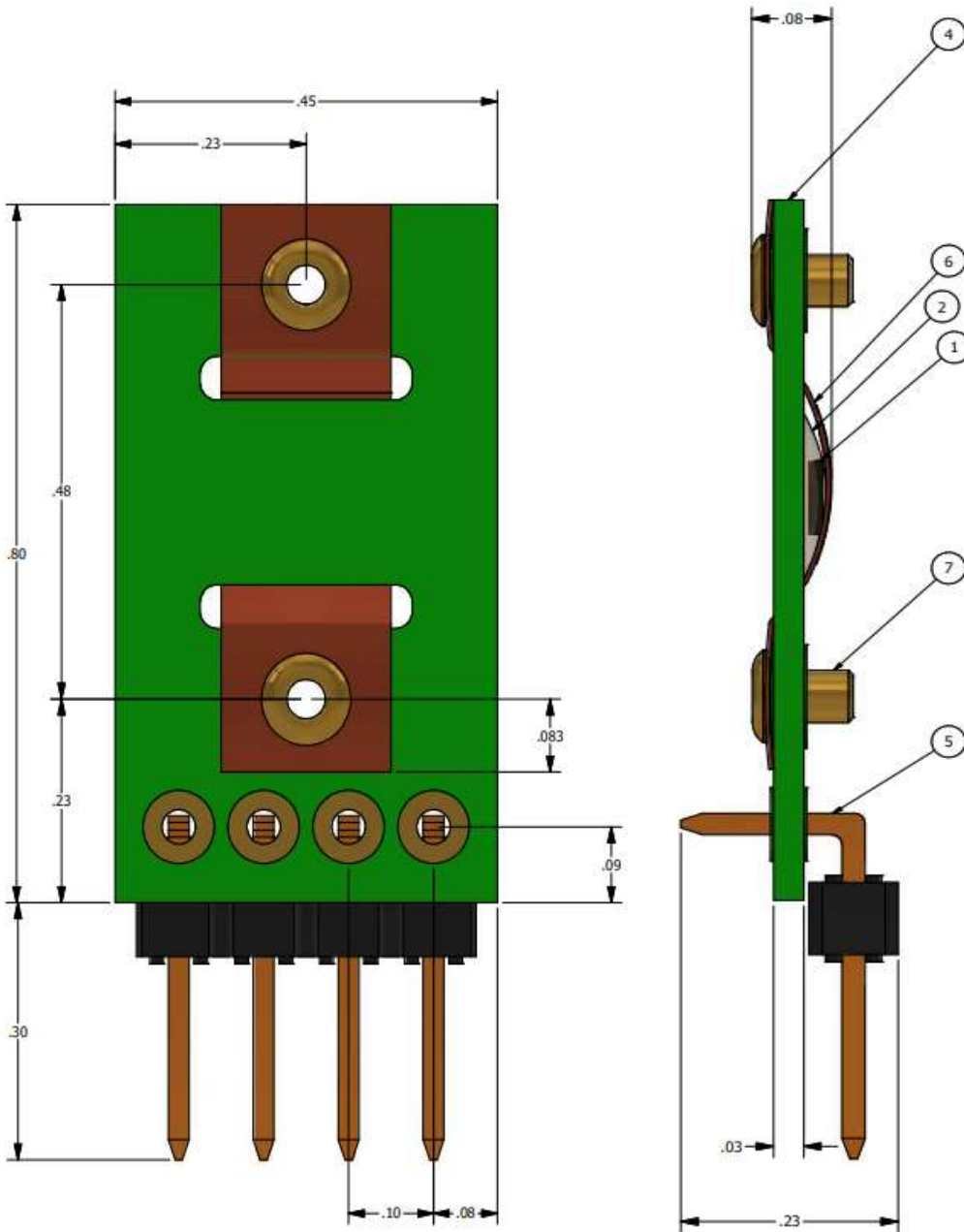
$$AH = MSB + LSB / 256$$

The Temperature output is a 8-bit integer in degrees C.

## Typical Application



## Mechanical Dimensions



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