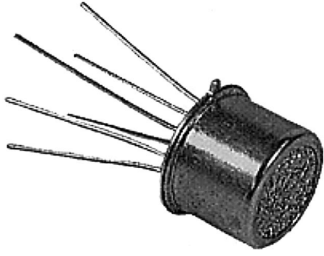


# Humidity Sensors

## Relative Humidity

# HIH Series



### FEATURES

- Linear voltage output vs %RH
- Laser trimmed interchangeability
- High accuracy, fast response
- Chemically resistant
- Stable, low drift performance
- Built-in static protection
- Ideal for dew point and absolute moisture measurements
- TO-39 housing

### TYPICAL APPLICATIONS

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM assemblies

### GENERAL INFORMATION

HIH-3602-A and HIH-3602-C Relative Humidity (RH) sensors combine both relative humidity and temperature sensing in a TO-5 housing with a hydrophobic sintered stainless steel filter

The laser trimmed thermoset polymer capacitive sensing elements have on-chip integrated signal conditioning. The temperature sensor is thermally connected with the RH sensor making the HIH-3602-A/C ideal for measuring dew point and other absolute moisture terms. Factory calibration data supplied with each sensor allows individually matched downstream electronics and  $\pm 2\%$  RH total accuracy.

### ORDER GUIDE

Catalog Listing	Description
HIH-3602-A	Monolithic IC humidity sensor with integral thermistor in TO-5 can
HIH-3602-C	Monolithic IC humidity sensor with integral precision RTD in TO-5 can

### NIST CALIBRATION

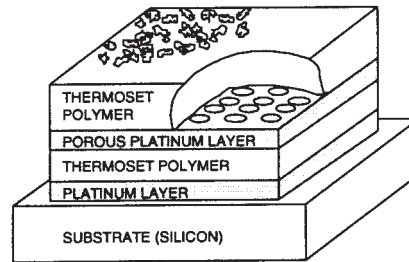
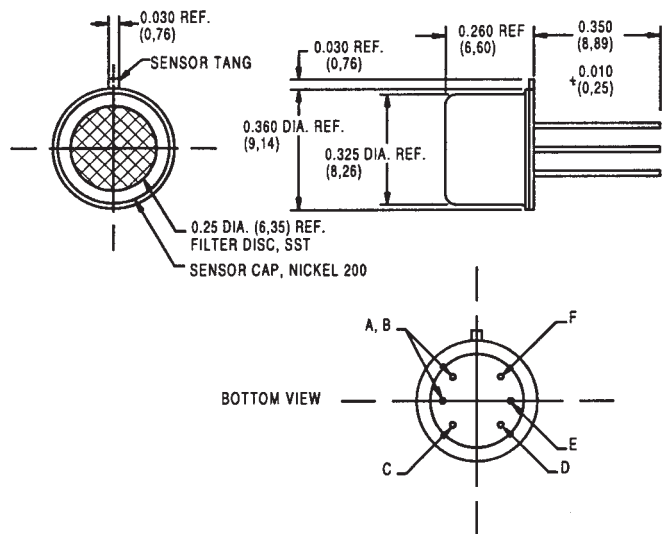
Each HIH-3602-A or HIH-3602-C sensor includes a sensor specific NIST calibration and data printout. Sensors are not individually serialized.

### RH SENSOR CONSTRUCTION

Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.

### MOUNTING DIMENSIONS (for reference only)

#### HIH-3602-A and HIH-3602-C



### CAUTION

#### PRODUCT DAMAGE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

### INTERNAL PIN CONNECTIONS

0.018 (0,46) dia. lead gold plated (6 places)	
A, B	(HIH-3602-A) Thermistor for temperature compensation
A, B	(HIH-3602-C) RTD for temperature compensation
C	+VDC supply
D	(-) Power or ground
E	VDC out
F	Case ground

Humidity

# Humidity Sensors

## Relative Humidity

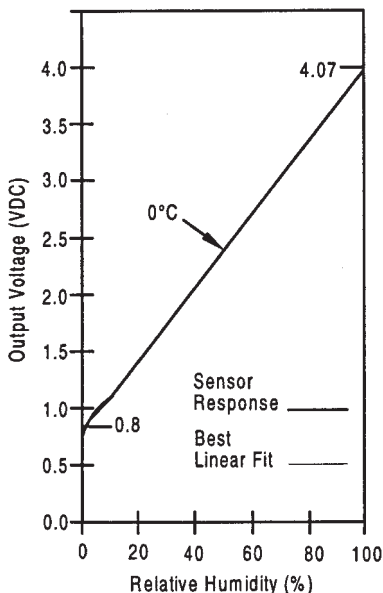
HIH Series

### PERFORMANCE SPECIFICATIONS

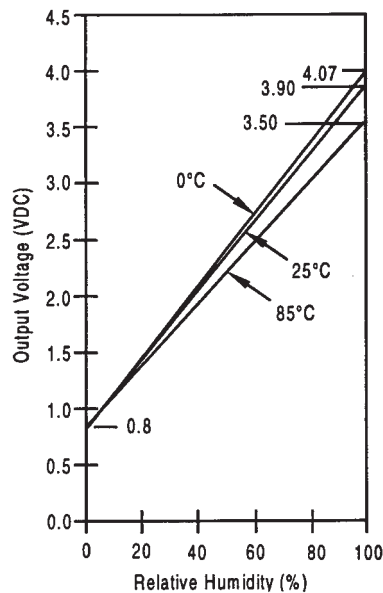
<b>Catalog Listing</b>	HIH-3602-A	HIH-3602-C
Temperature Sensor	R <sub>b</sub> = 100 kΩ ±5% @ 25°C, NTC 0-50°C, β = 4143K, T = °K R(T) = R <sub>b</sub> exp (β/T-β/298.15)	1000Ω ±0.2% @ 0°C Thin Film Platinum RTD alpha = 0.00375 Ω/Ω/°C
Temperature Accuracy	±3.0°C @ 25°C	±0.5°C @ 25°C
RH Accuracy <sup>(1)</sup>	±2% RH, 0-100% RH non-condensing, 25°C, V <sub>supply</sub> = 5 VDC	
RH Interchangeability	±5% RH, 0-60% RH; ±8% @ 90% RH	
RH Linearity	±0.5% RH typical	
RH Hysteresis	±1.2% of RH span maximum	
RH Repeatability	±0.5% RH	
RH Response Time, 1/e	50 sec in slowly moving air at 25°C	
RH Stability	±1% RH typical at 50% RH in 5 years	
Power Requirements Voltage Supply Current Supply	4 to 5.8 VDC, sensor calibrated at 5 VDC 200 μA at 5 VDC, 2 mA typical at 9 VDC	
Voltage Output  V <sub>supply</sub> = 5 VDC Drive Limits	V <sub>out</sub> = V <sub>supply</sub> (0.0062 (Sensor RH) + 0.16), typical @ 25°C (Data printout provides a similar, but sensor specific, equation at 25°C.) 0.8 to 3.9 VDC output @ 25°C typical Push/pull symmetric; 50 μA typical, 20 μA minimum, 100 μA maximum Turn-on ≤0.1 second	
Temp. Compensation  Effect @ 0% RH Effect @ 100% RH	True RH = (Sensor RH)/(1.093-0.0012T), T in °F True RH = (Sensor RH)/(1.0546-0.00216T), T in °C ±0.007% RH/°C (negligible) -0.22% RH/°C (<1% RH effect typical in occupied space systems above 15°C (59°F))	
Humidity Range Operating Storage	0 to 100% RH, non-condensing <sup>(1)</sup> 0 to 90% RH, non-condensing	
Temperature Range Operating Storage	-40° to 85°C (-40° to 185°F) -40° to 125°C (-40° to 275°F)	
Package	TO-5 with 60μ hydrophobic sintered stainless steel filter, resists condensation	
Handling	Static sensitive diode protected to 15 kV maximum	

1. Extended exposure to ≥90% RH causes a reversible shift of 3% RH.

**OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C)**



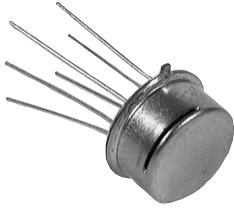
**OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C, 25°C, and 85°C)**



# Humidity Sensors

## Relative Humidity

HIH Series



### FEATURES

- Linear voltage output vs %RH
- Laser trimmed interchangeability
- High accuracy
- Fast response
- Stable, low drift performance
- Chemically resistant
- Built-in static protection

### TYPICAL APPLICATIONS

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM assemblies

### GENERAL INFORMATION

The HIH-3602-L IC (Integrated Circuit) Relative Humidity (RH) sensor delivers instrumentation quality RH sensing performance in a rugged, low cost, slotted TO-39 housing.

The RH sensor is a thermoset polymer capacitive sensing element with on-chip integrated signal conditioning. On-board signal conditioning reduces product development times while a typical current draw of only 200  $\mu$ A makes the HIH-3602-L perfect for battery powered systems.

### ORDER GUIDE

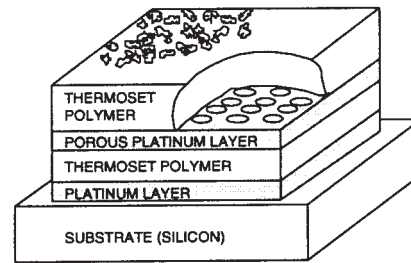
Catalog Listing	Description
HIH-3602-L	Integrated circuit humidity sensor in TO-39 can
HIH-3602-L-CP	Integrated circuit humidity sensor in TO-39 can with calibration and data printout

### NIST CALIBRATION

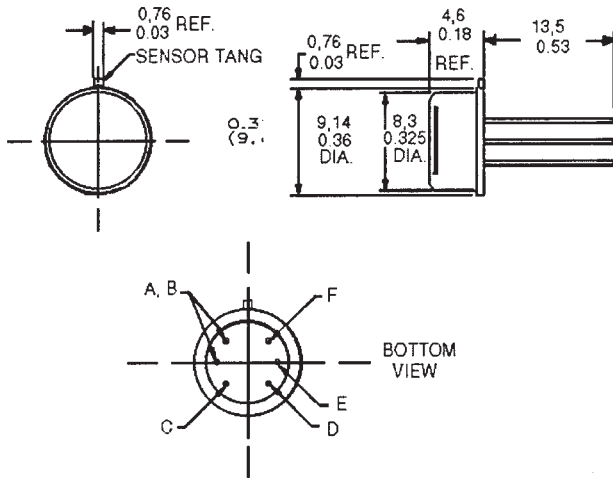
HIH-3602-L may be ordered with a NIST calibration and sensor specific data printout. Append “-CP” to the model number to order.

### RH SENSOR CONSTRUCTION

Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.



### MOUNTING DIMENSIONS (for reference only)



### INTERNAL PIN CONNECTIONS

0.018 (0,46) dia. lead gold plated (6 places)	
A, B	No connection
C	+VDC supply
D	(-) Power or ground
E	VDC out
F	Case ground

### CAUTION

#### PRODUCT DAMAGE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.



# Humidity Sensors

## Relative Humidity

HIH Series

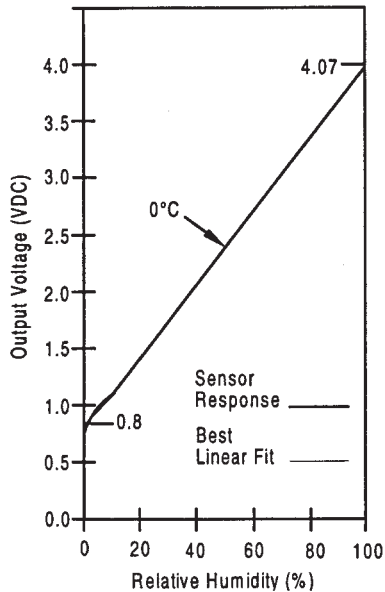
### PERFORMANCE SPECIFICATIONS

Parameter	Conditions
RH Accuracy <sup>(1)</sup>	±2% RH, 0-100% RH non-condensing, 25°C, V <sub>supply</sub> = 5 VDC
RH Interchangeability	±5% RH, 0-60% RH; ±8% @ 90% RH typical
RH Linearity	±0.5% RH typical
RH Hysteresis	±1.2% of RH span maximum
RH Repeatability	±0.5% RH
RH Response Time, 1/e	30 seconds in slowly moving air at 25°C
RH Stability	±1% RH typical at 50% RH in 5 years
Power Requirements	
Voltage Supply	4 to 5.8 VDC, sensor calibrated at 5 VDC
Current Supply	200 µA at 5 VDC, 2 mA typical at 9 VDC
Voltage Output	V <sub>out</sub> = V <sub>supply</sub> (0.0062 (Sensor RH) + 0.16), typical @ 25°C (Data printout provides a similar, but sensor specific, equation at 25°C.)
V <sub>supply</sub> = 5 VDC	0.8 to 3.9 VDC output @ 25°C typical
Drive Limits	Push/pull symmetric; 50 µA typical, 20 µA minimum, 100 µA maximum Turn-on ≤0.1 second
Temp. Compensation	True RH = (Sensor RH)/(1.093-0.0012T), T in °F True RH = (Sensor RH)/(1.0546-0.00216T), T in °C
Effect @ 0% RH	±0.007% RH/°C (negligible)
Effect @ 100% RH	-0.22% RH/°C (<1% RH effect typical in occupied space systems above 15°C (59°F))
Humidity Range	
Operating	0 to 100% RH, non-condensing
Storage	0 to 90% RH, non-condensing <sup>(1)</sup>
Temperature Range	
Operating	-40°C to 85°C (-40°F to 185°F)
Storage	-40°C to 125°C (-40°F to 257°F)
Package	Six pin TO-39 with slotted nickel cap <sup>(2)</sup>
Handling	Static sensitive, diode protected to 15 kV maximum

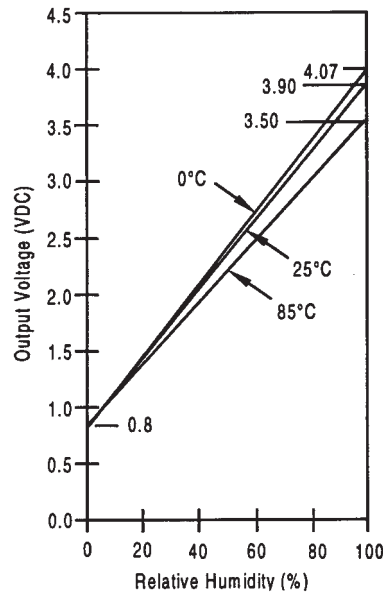
#### Notes:

1. Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
2. This sensor is light sensitive. For best results, shield the sensor from bright light.

OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C)



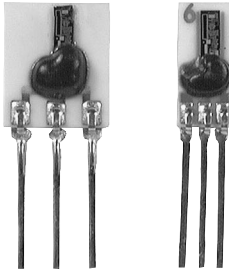
OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C, 25°C, and 85°C)



# Humidity Sensors

## Relative Humidity

HIH Series



### FEATURES

- Linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- High accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

### TYPICAL APPLICATIONS

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM assemblies

### GENERAL INFORMATION

The HIH-3605 monolithic IC (Integrated Circuit) humidity sensor is designed specifically for high volume OEM (Original Equipment Manufacturer) users. Direct input to a controller or other device is made possible by this sensor's linear voltage output. With a typical current draw of only 200  $\mu$ A, the HIH-3605 is ideally suited for low drain, battery powered systems.

The HIH-3605 delivers instrumentation quality RH sensing performance in a low cost, solderable SIP (Single In-line Package). Available in two lead spacing configurations, the RH sensor is a laser trimmed thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

### ORDER GUIDE

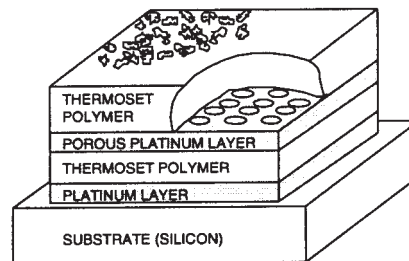
Catalog Listing	Description
HIH-3605-A	Integrated circuit humidity sensor, 0.100 in. lead pitch SIP
HIH-3605-A-CP	Integrated circuit humidity sensor, 0.100 in. lead pitch SIP with calibration and data printout
HIH-3605-B	Integrated circuit humidity sensor, 0.050 in. lead pitch SIP
HIH-3605-B-CP	Integrated circuit humidity sensor, 0.050 in. lead pitch SIP with calibration and data printout.

### NIST CALIBRATION

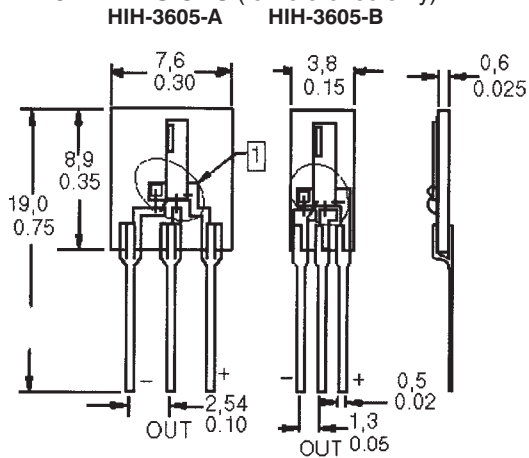
HIH-3605 sensors may be ordered with a NIST calibration and sensor specific data printout. Append "-CP" to the model number to order.

### RH SENSOR CONSTRUCTION

Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.



### MOUNTING DIMENSIONS (for reference only)



1 Protective Sealant

### CAUTION

#### PRODUCT DAMAGE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take normal ESD precautions when handling this product.

Humidity

# Humidity Sensors

## Relative Humidity

HH Series

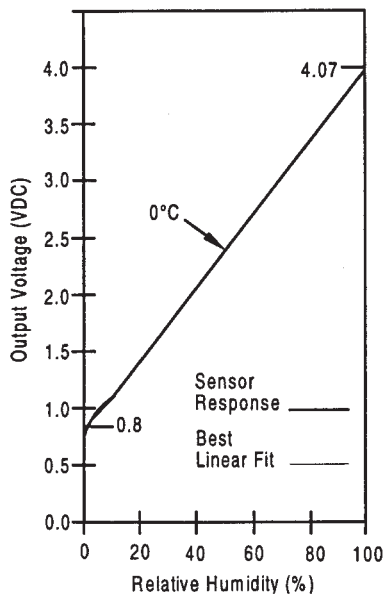
### PERFORMANCE SPECIFICATIONS

Parameter	Conditions
RH Accuracy <sup>(1)</sup>	±2% RH, 0-100% RH non-condensing, 25°C, V <sub>supply</sub> = 5 VDC
RH Interchangeability	±5% RH, 0-60% RH; ±8% @ 90% RH typical
RH Linearity	±0.5% RH typical
RH Hysteresis	±1.2% of RH span maximum
RH Repeatability	±0.5% RH
RH Response Time, 1/e	15 sec in slowly moving air at 25°C
RH Stability	±1% RH typical at 50% RH in 5 years
Power Requirements	
Voltage Supply	4 to 5.8 VDC, sensor calibrated at 5 VDC
Current Supply	200 µA at 5 VDC, 2 mA typical at 9 VDC
Voltage Output	V <sub>out</sub> = V <sub>supply</sub> (0.0062 (Sensor RH) + 0.16), typical @ 25°C (Data printout provides a similar, but sensor specific, equation at 25°C.)
V <sub>supply</sub> = 5 VDC	0.8 to 3.9 VDC output @ 25°C typical
Drive Limits	Push/pull symmetric; 50 µA typical, 20 µA minimum, 100 µA maximum Turn-on ≤0.1 second
Temp. Compensation	True RH = (Sensor RH)/(1.093-0.0012T), T in °F True RH = (Sensor RH)/(1.0546-0.00216T), T in °C
Effect @ 0% RH	±0.007% RH/°C (negligible)
Effect @ 100% RH	-0.22% RH/°C (<1% RH effect typical in occupied space systems above 15°C (59°F))
Humidity Range	
Operating	0 to 100% RH, non-condensing <sup>(1)</sup>
Storage	0 to 90% RH, non-condensing
Temperature Range	
Operating	-40° to 85°C (-40° to 185°F)
Storage	-51° to 125°C (-60° to 257°F)
Package <sup>(2)</sup>	Three pin solderable ceramic SIP
Handling	Static sensitive diode protected to 15 kV maximum

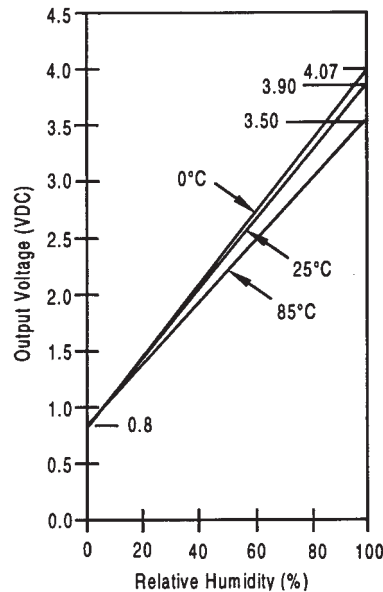
#### Notes:

1. Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
2. This sensor is light sensitive. For best results, shield the sensor from bright light.

OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C)



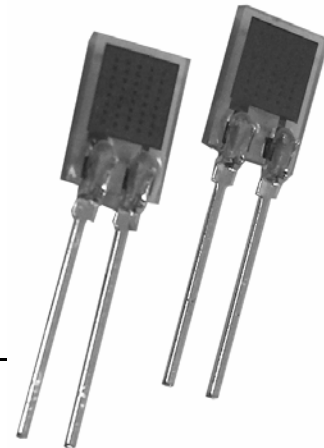
OUTPUT VOLTAGE VS RELATIVE HUMIDITY (at 0°C, 25°C, and 85°C)



## HCH-1000 Series

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### Capacitive Humidity Sensor



#### DESCRIPTION

The HCH-1000 series humidity sensor is a capacitive polymer sensor designed for relative humidity measurement. The sensor converts humidity value into capacitance, which can be measured electronically.

Polyimide is used as a humidity sensing material because of its inherent IC (Integrated Circuit) processing compatibility, reduced temperature dependence and enhanced resistance against contamination. The HCH-1000-Series is manufactured using semiconductor technology.

#### FEATURES

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- Polymer sensing offers enhanced resistance against contamination
- Reduced temperature dependence
- Semiconductor fabrication technology
- Uses glass wafer as substrate
- Enhanced sensitivity and accuracy, fast response
- Low hysteresis and long-term stability

The sensor consists of a grid top electrode, a polyimide layer, and a bottom electrode. The grid top electrode on the bottom electrode provides enhanced sensitivity when compared to that of a standard structure.

A cased version, for dust protection, and an uncased version are available.

#### POTENTIAL APPLICATIONS

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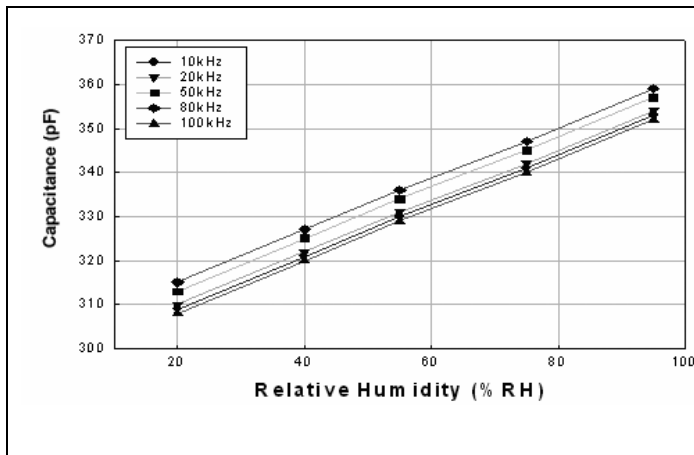
- Hygrometers, consumer goods
- Humidifiers and dehumidifiers
- Medical
- Automotive
- HVAC systems
- Weather stations

# HCH-1000 Series

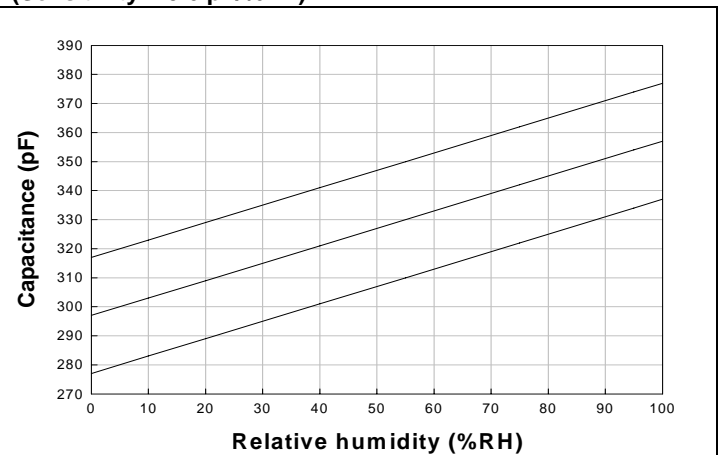
**SPECIFICATIONS** ( $T_A = 25\text{ }^\circ\text{C}$  [77  $^\circ\text{F}$ ], Input Voltage = 1  $V_{RMS}$ , Frequency = 20 kHz)

Characteristic	Min.	Typ.	Max.	Unit	Note
Normal capacitance	310	330	350	pF	at 55% RH
Sensitivity	0.55	0.60	0.65	pF/%RH	10% RH to 95% RH
Humidity hysteresis	–	$\pm 2$	–	%RH	–
Linearity	–	$\pm 2$	–	%RH	–
Response time	–	15	–	sec	30% RH to 90% RH
Temperature coefficient	0.15	0.16	0.17	pF/ $^\circ\text{C}$	5 $^\circ\text{C}$ to 70 $^\circ\text{C}$ [41 $^\circ\text{F}$ to 158 $^\circ\text{F}$ ]
Long-term stability (drift)	–	0.2	–	%RH/year	–
Operating temperature range	-40 [-40]	–	120 [248]	$^\circ\text{C}$ [ $^\circ\text{F}$ ]	–
Operating humidity range	0%	–	100%	RH	–
Operating frequency range	1	–	100	kHz	–

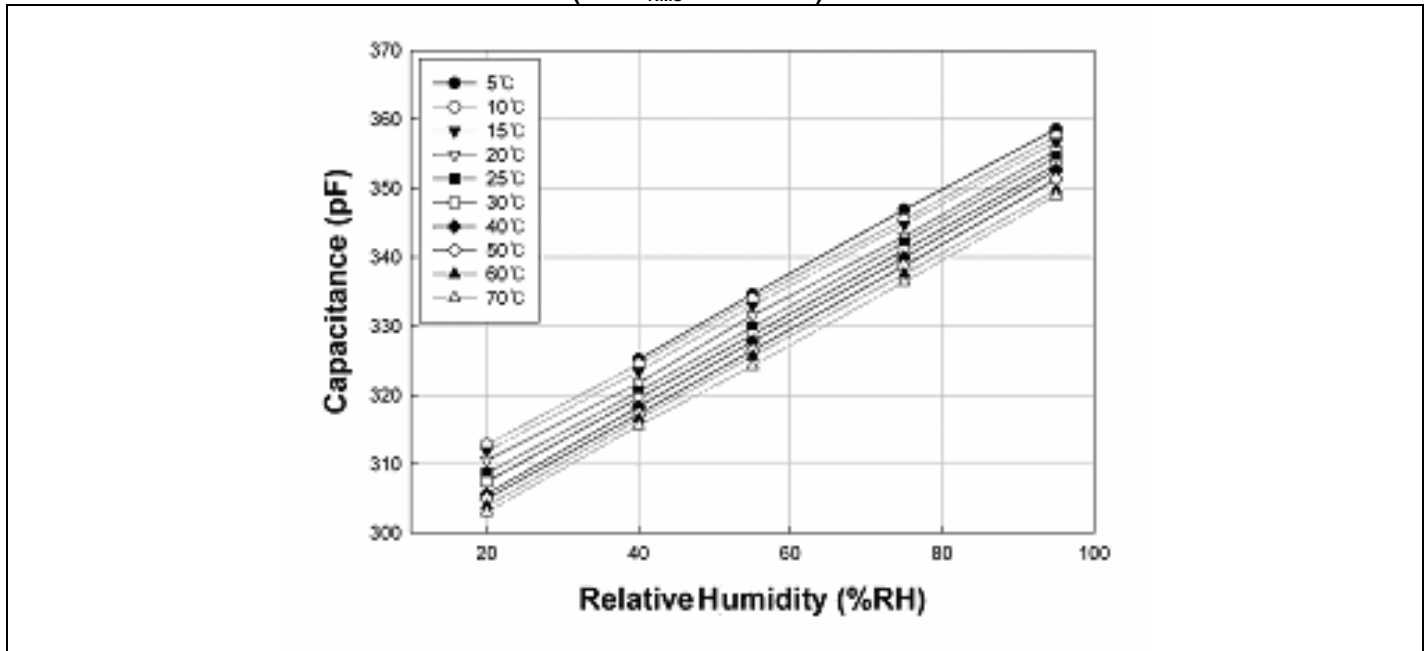
**FIGURE 1: FREQUENCY CHARACTERISTICS**



**FIGURE 2: TYPICAL HUMIDITY RESPONSE**  
(Sensitivity = 0.6 pF/%RH)



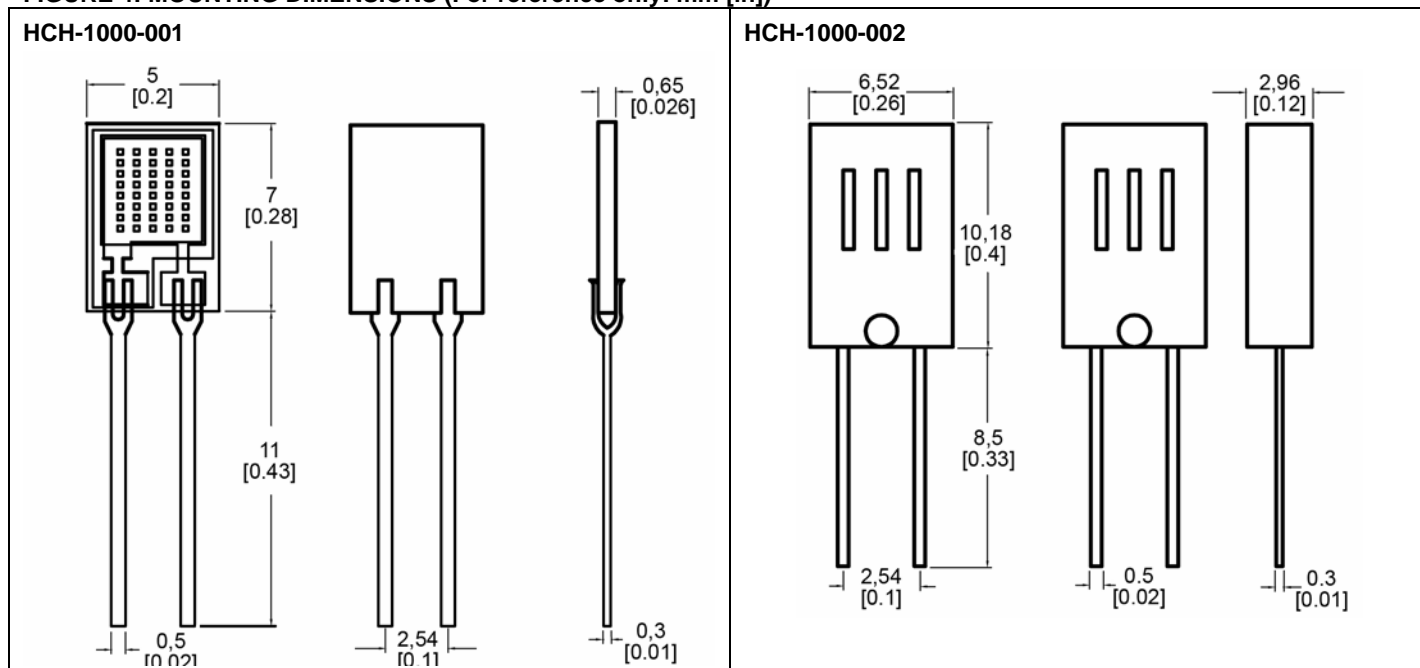
**FIGURE 3: TEMPERATURE CHARACTERISTICS (At 1  $V_{RMS}$  and 20 kHz)**





# Capacitive Humidity Sensors

FIGURE 4: MOUNTING DIMENSIONS (For reference only: mm [in])



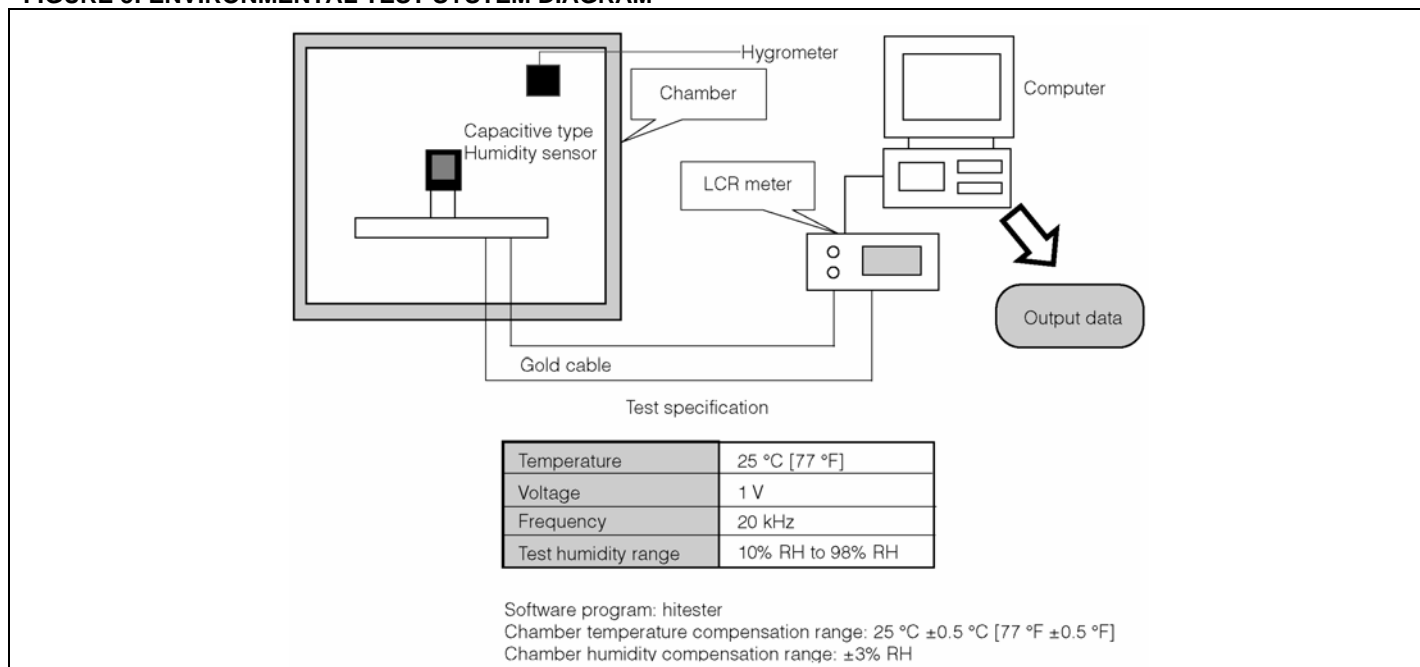
### ENVIRONMENTAL TEST SYSTEM

Figure 5 depicts environmental testing. The devices are characterized at 25 °C [77 °F] between 20% RH and 95% RH. The meter is set to measure capacitance at 1 V and 20 kHz.

For a precise measurement, a hygrometer is compared with the humidity of the temperature-humidity chamber.

The data output indicates the effect of sensor characterization before/after environmental tests.

FIGURE 5: ENVIRONMENTAL TEST SYSTEM DIAGRAM



## ORDER GUIDE

Catalog Listing	Description
HCH-1000-001	HCH Series capacitive polymer humidity sensor, 2,54 mm [0.100 in] lead pitch SIP
HCH-1000-002	HCH Series capacitive polymer humidity sensor, 2,54 mm [0.100 in] lead pitch SIP, cased version

### **WARNING**

#### **PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

#### **WARRANTY/REMEDY**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

### **WARNING**

#### **MISUSE OF DOCUMENTATION**

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

#### **SALES AND SERVICE**

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

**E-mail:** [info.sc@honeywell.com](mailto:info.sc@honeywell.com)

**Internet:** [www.honeywell.com/sensing](http://www.honeywell.com/sensing)

#### **Phone and Fax:**

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+44 (0) 1698 481676 Fax  
Latin America +1-305-805-8188  
+1-305-883-8257 Fax  
USA/Canada +1-800-537-6945  
+1-815-235-6847  
+1-815-235-6545 Fax

Sensing and Control  
1985 Douglas Drive North  
Minneapolis, MN 55422  
[www.honeywell.com/sensing](http://www.honeywell.com/sensing)

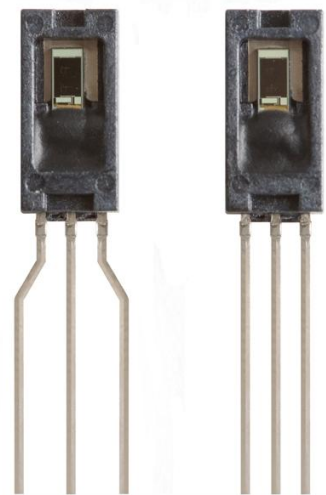
009019-1-EN IL50 GLO Printed in USA  
July 2007  
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# Honeywell

## HIH-4000 Series

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### Humidity Sensors



#### DESCRIPTION

The HIH-4000 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200  $\mu$ A, the HIH-4000 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

#### FEATURES

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- Molded thermoset plastic housing
- Near linear voltage output vs % RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

The HIH-4000 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SIP (Single In-line Package).

Available in two lead spacing configurations, the RH sensor is a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as wetting, dust, dirt, oils and common environmental chemicals.

#### POTENTIAL APPLICATIONS

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- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

# HIH-4000 Series

**Table 1. Performance Specifications (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)**

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysteresis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH)	–	1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	2
Current supply	–	200	500	µA	–
Voltage output (1 <sup>st</sup> order curve fit)	$V_{OUT} = (V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$ , typical at 25 °C				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in °C				
Output voltage temperature, coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity	0	See Figure 1.	100	% RH	3
Storage temperature	-50[-58]	–	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	3

**Specific Notes:**

- Can only be achieved with the supplied slope and offset.  
For HIH-4000-003 and HIH-4000-004 catalog listings only.
- Device is calibrated at 5 Vdc and 25 °C.
- Non-condensing environment.

**General Notes:**

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

**FACTORY CALIBRATION DATA**

HIH-4000 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

**Table 2. Example Data Printout**

Model	HIH-4000-003
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V	
V <sub>OUT</sub> at 0% RH	0.826 V
V <sub>OUT</sub> at 75.3% RH	3.198 V
Linear output for 3.5% RH accuracy at 25 °C	
Zero offset	0.826 V
Slope	31.483 mV/%RH
RH	(V <sub>OUT</sub> - zero offset)/slope (V <sub>OUT</sub> - 0.826)/0.0315
Ratiometric response for 0% RH to 100% RH	
V <sub>OUT</sub>	V <sub>SUPPLY</sub> (0.1652 to 0.7952)



# Humidity Sensors

Figure 1. Operating Environment (Non-condensing environment.)

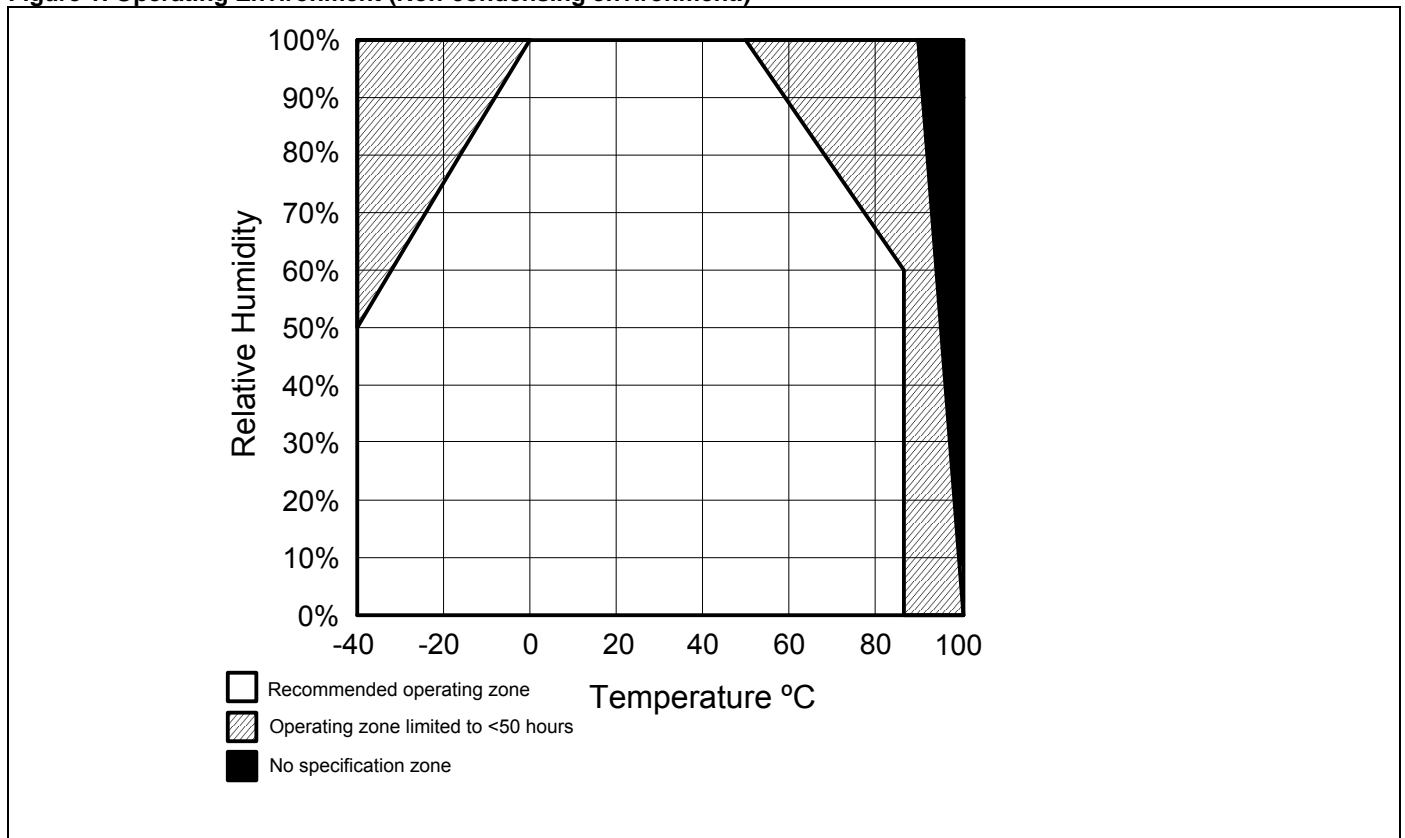
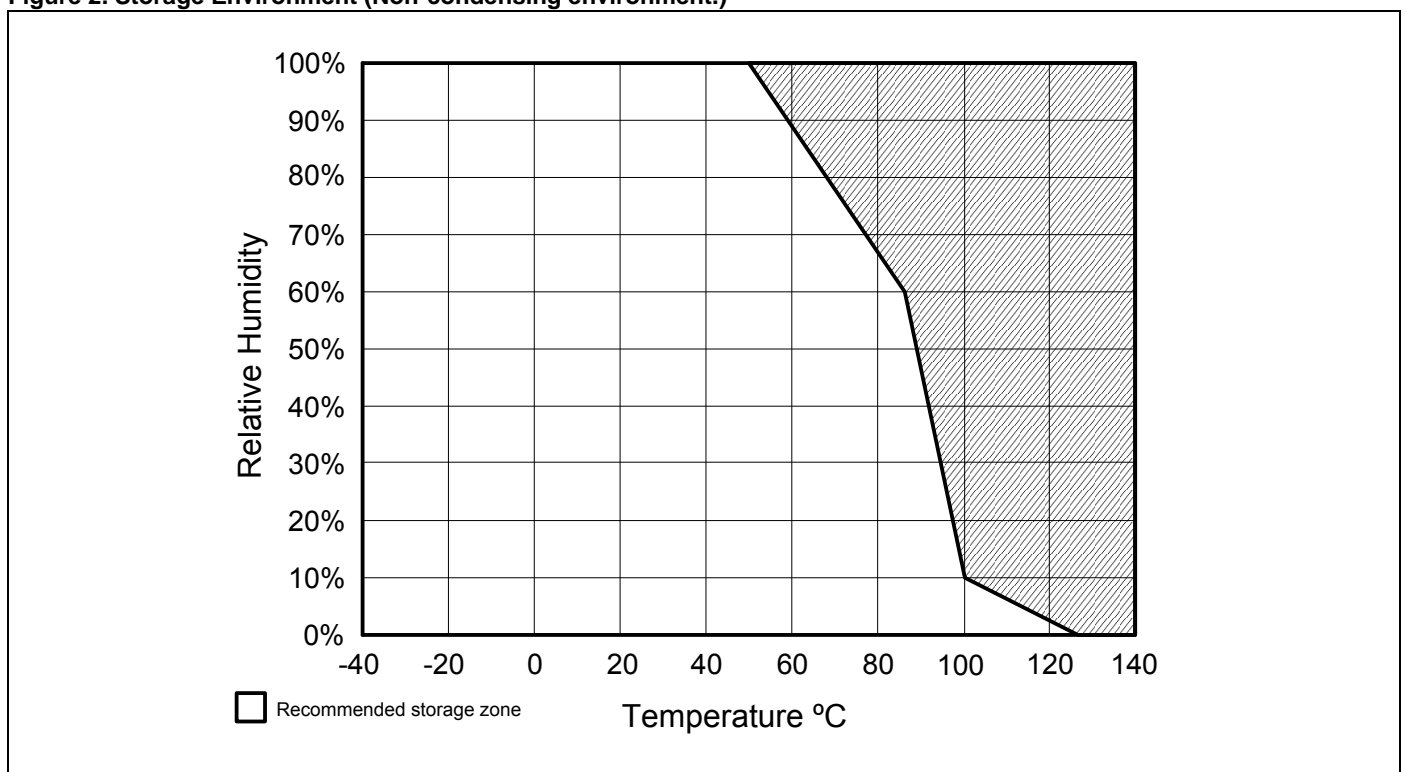


Figure 2. Storage Environment (Non-condensing environment.)



# HIH-4000 Series

Figure 3. Typical Output Voltage vs Relative Humidity (At 25 °C and 5 V.)

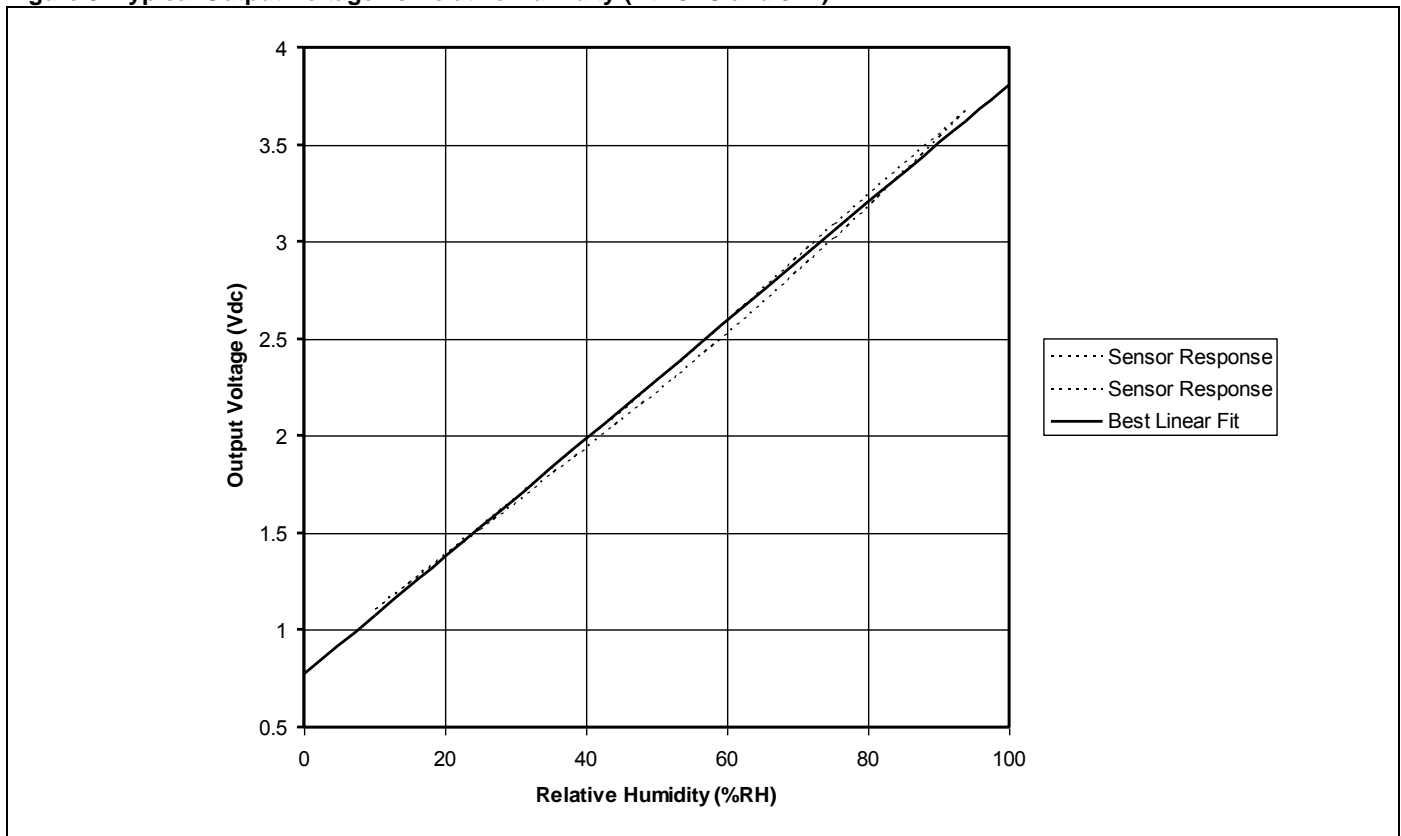
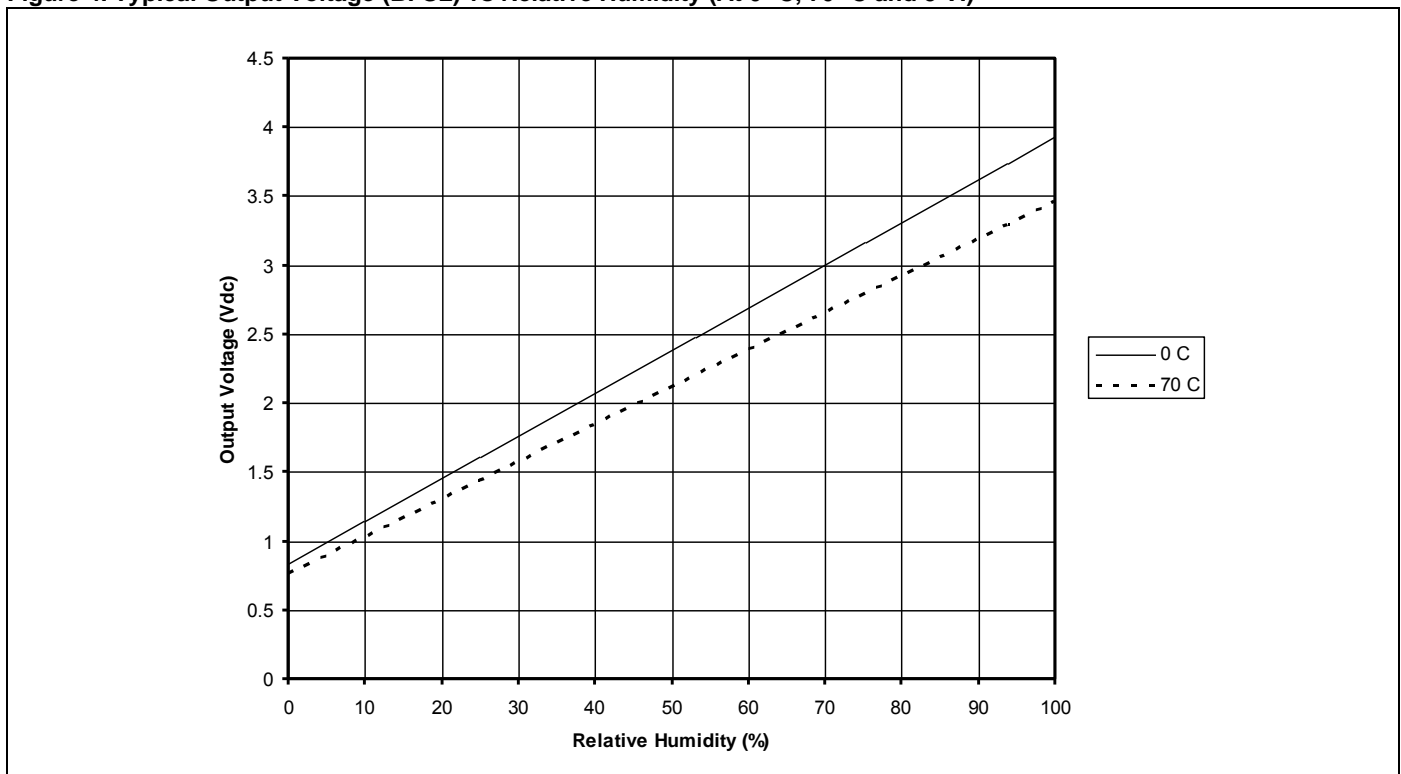


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 °C, 70 °C and 5 V.)



# Humidity Sensors

Figure 5. Mounting Dimensions (For reference only. mm/[in])

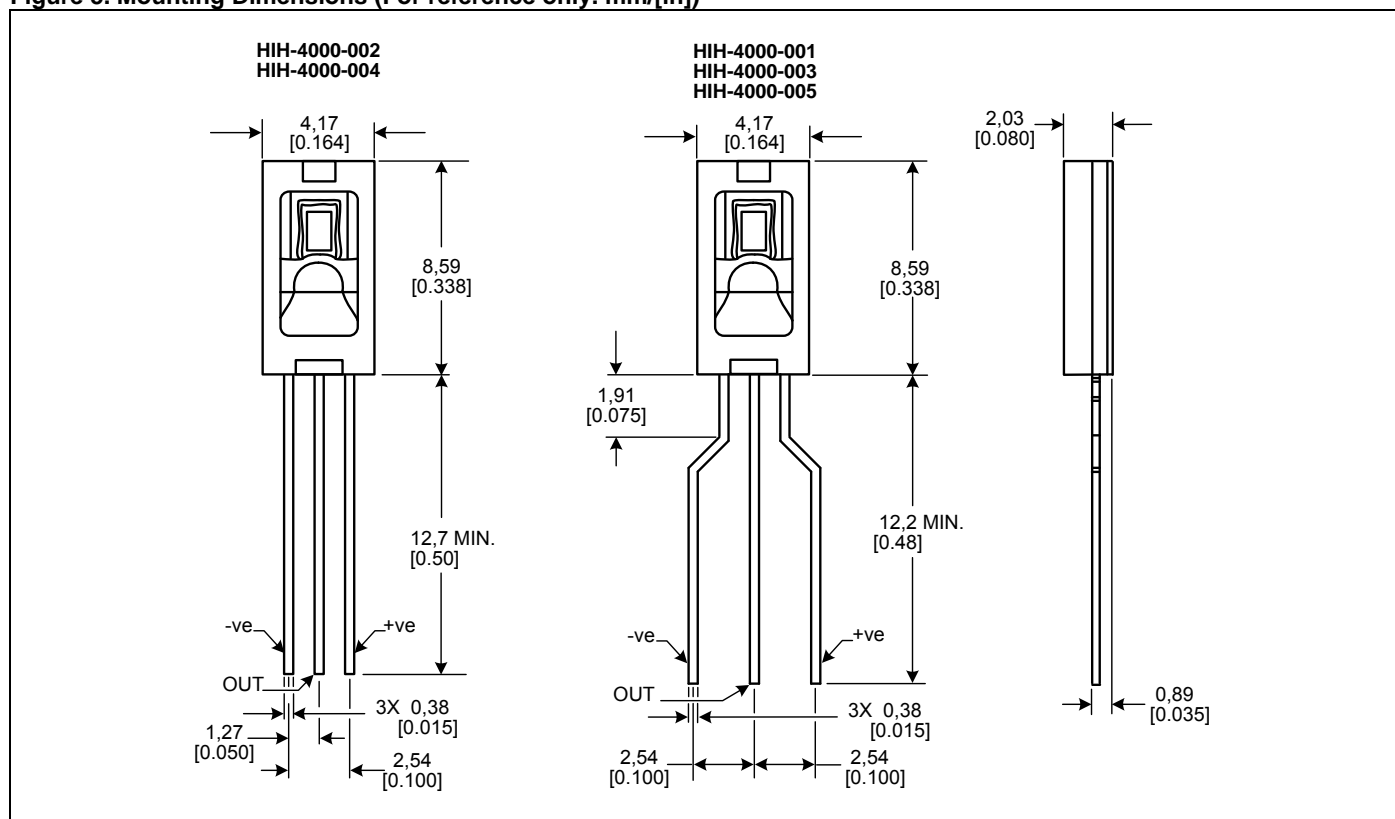
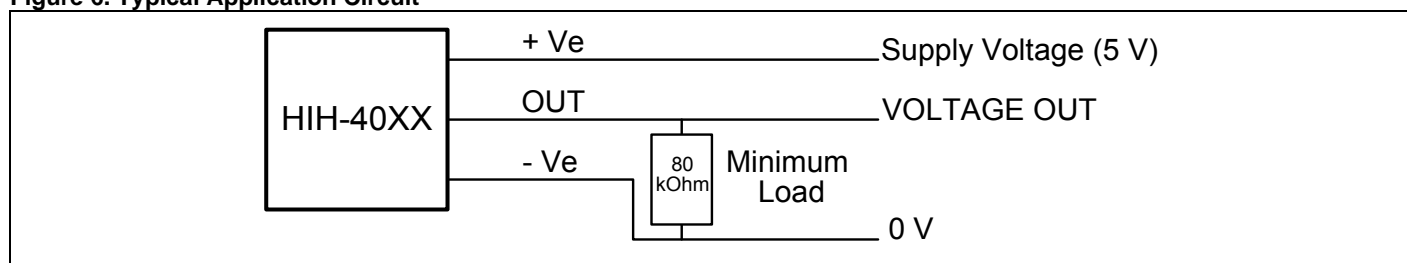


Figure 6. Typical Application Circuit



## ORDER GUIDE

Catalog Listing	Description
HIH-4000-001	Integrated circuit humidity sensor, 2,54 mm [0.100 in] lead pitch SIP
HIH-4000-002	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP
HIH-4000-003	Integrated circuit humidity sensor, 2,54 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4000-004	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4000-005	Equivalent to HIH-4000-001

## ADDITIONAL HUMIDITY SENSOR INFORMATION

See the following associated literature at [www.honeywell.com/sensing](http://www.honeywell.com/sensing):

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

## **WARNING**

### **MISUSE OF DOCUMENTATION**

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

### **WARRANTY/REMEDY**

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

## **WARNING**

### **PERSONAL INJURY**

**DO NOT USE** these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

### **SALES AND SERVICE**

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

**E-mail:** [info.sc@honeywell.com](mailto:info.sc@honeywell.com)

**Internet:** [www.honeywell.com/sensing](http://www.honeywell.com/sensing)

### **Phone and Fax:**

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Latin America	+1-305-805-8188 +1-305-883-8257 Fax
USA/Canada	+1-800-537-6945 +1-815-235-6847 +1-815-235-6545 Fax

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# Honeywell



## HIH-4010/4020/4021 Series

### Humidity Sensors



#### DESCRIPTION

The HIH-4010/4020/4021 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200  $\mu$ A, the HIH-4010/4020/4021 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

The HIH-4010/4020/4021 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SIP (Single In-line Package).

#### FEATURES

- Molded thermoset plastic housing
- Near linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

The HIH-4010 is an uncovered integrated humidity sensor, the HIH-4020 is a covered integrated circuit humidity sensor, and the HIH-4021 is a covered, condensation-resistant, integrated circuit humidity sensor. All three products are available in two lead space configurations.

The RH sensor is a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as wetting, dust, dirt, oils and common environmental chemicals. Both products are available in two lead spacing configurations, as well as with or without calibration and data printouts.

#### POTENTIAL APPLICATIONS

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

# HIH-4010/4020/4021 Series

**TABLE 1. PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)**

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysteresis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50 %RH in 1 year)	–	±1.2	–	% RH	2
Stability (at 50 %RH in 1 year)	–	±0.5	–	% RH	3
Voltage supply	4	–	5.8	Vdc	4
Current supply	–	200	500	µA	–
Voltage output (1 <sup>st</sup> order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$ , typical at 25 °C				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in °C				
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity (HIH-4010)	0	See Figure 1.	100	% RH	5
Operating humidity (HIH-4020)	0	See Figure 1.	100	% RH	5
Operating humidity (HIH-4021)	0	See Figure 1.	100	% RH	–
Storage temperature	-50[-58]	–	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	5

**Specific Notes:**

1. For HIH-4010/20/21-003/004 catalog listings only.
2. Includes testing outside of recommended operating zone.
3. Includes testing for recommended operating zone only.
4. Device is calibrated at 5 Vdc and 25 °C.
5. Non-condensing environment. When liquid water falls on the humidity sensor die, output goes to a low rail condition indicating no humidity.

**General Notes:**

- Sensor is ratiometric to supply voltage.
- Extended exposure to >90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

**FACTORY CALIBRATION DATA**

HIH-4010/4020/4021 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

**TABLE 2. EXAMPLE DATA PRINTOUT**

Model	HIH-4010-003
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V	
V <sub>OUT</sub> at 0% RH	0.958 V
V <sub>OUT</sub> at 75.3% RH	3.268 V
Linear output for 3.5% RH accuracy at 25 °C	
Zero offset	0.958 V
Slope	30.680 mV/%RH
Sensor RH	(V <sub>OUT</sub> - zero offset)/slope (V <sub>OUT</sub> - 0.958)/0.0307
Ratiometric response for 0% RH to 100% RH	
V <sub>OUT</sub>	V <sub>SUPPLY</sub> (0.1915 to 0.8130)

For HIH-4010-001/002/003/004 catalog listings only.

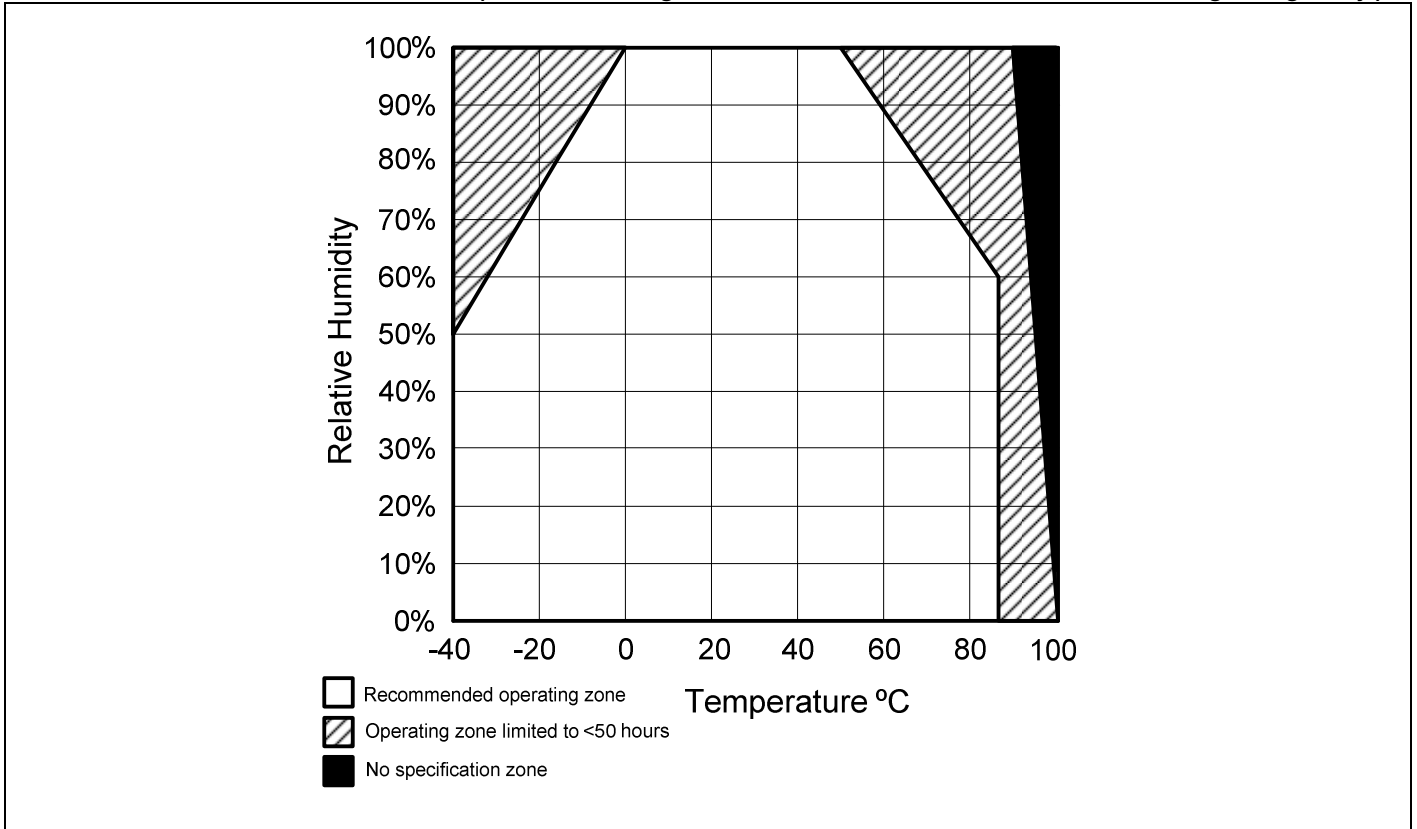


For HIH-4020-001/002/003/004 and HIH-4021-001/002/003/004 catalog listings only.

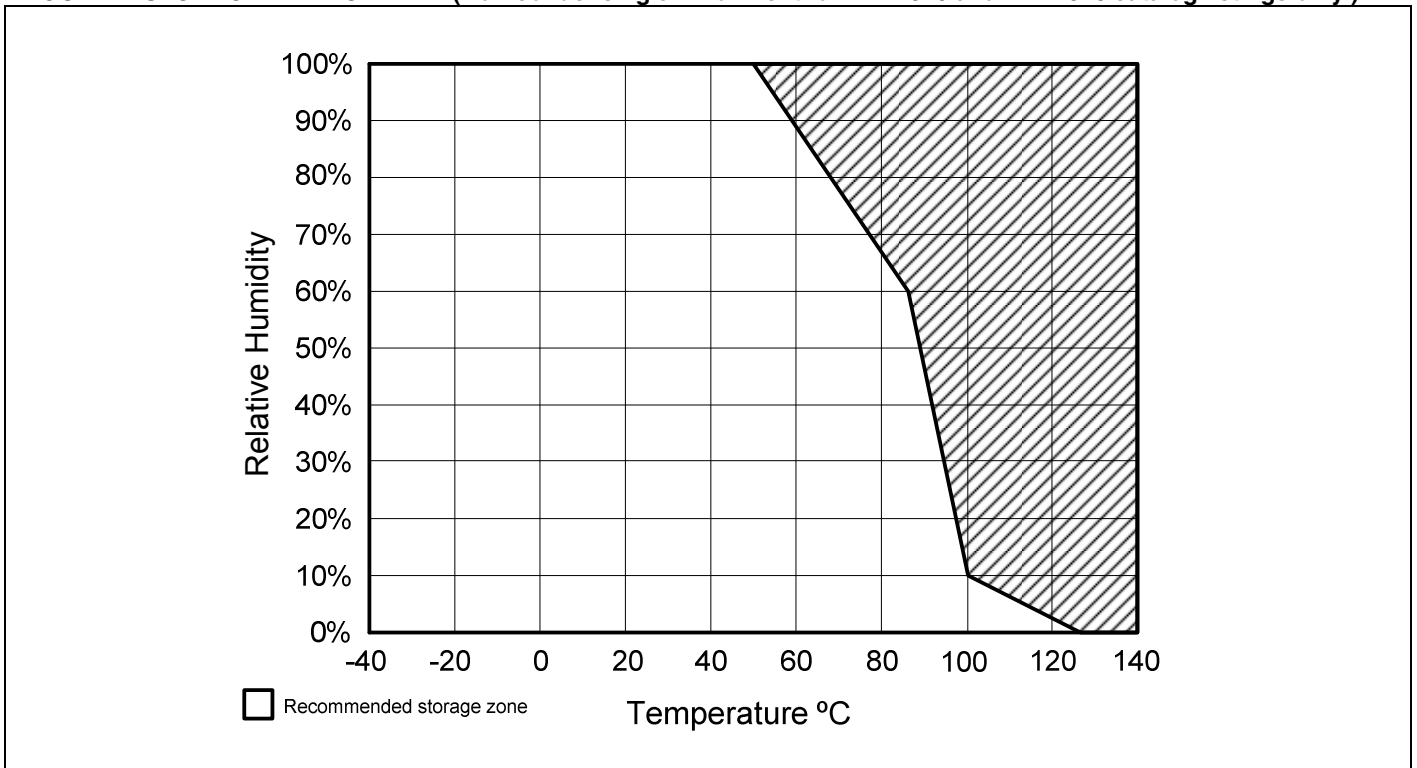


# Humidity Sensors

**FIGURE 1. OPERATING ENVIRONMENT (Non-condensing environment for HIH-4010 and HIH-4020 catalog listings only.)**



**FIGURE 2. STORAGE ENVIRONMENT (Non-condensing environment for HIH-4010 and HIH-4020 catalog listings only.)**



# HIH-4010/4020/4021 Series

FIGURE 3. TYPICAL OUTPUT VOLTAGE VS RELATIVE HUMIDITY (At 25 °C and 5 V.)

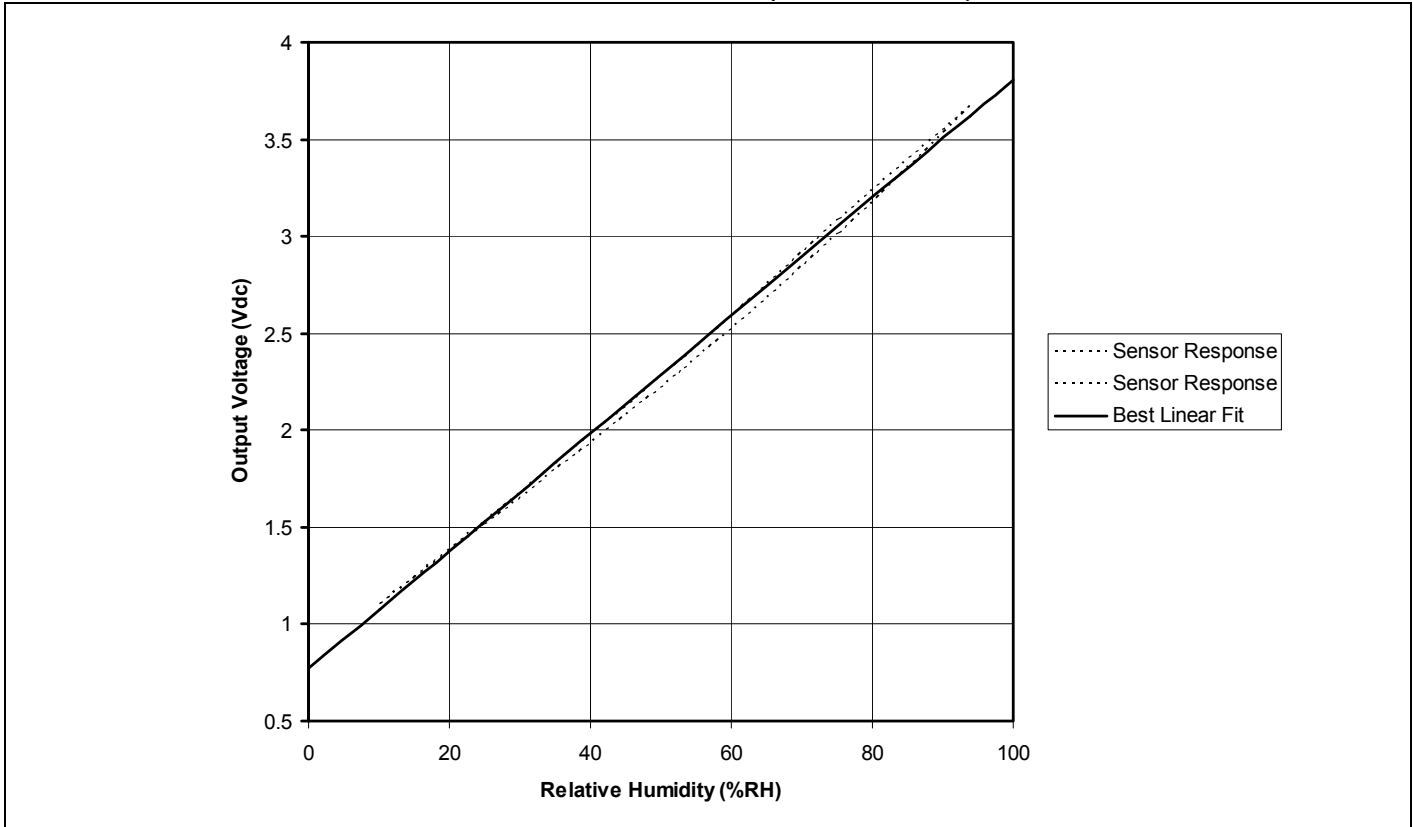
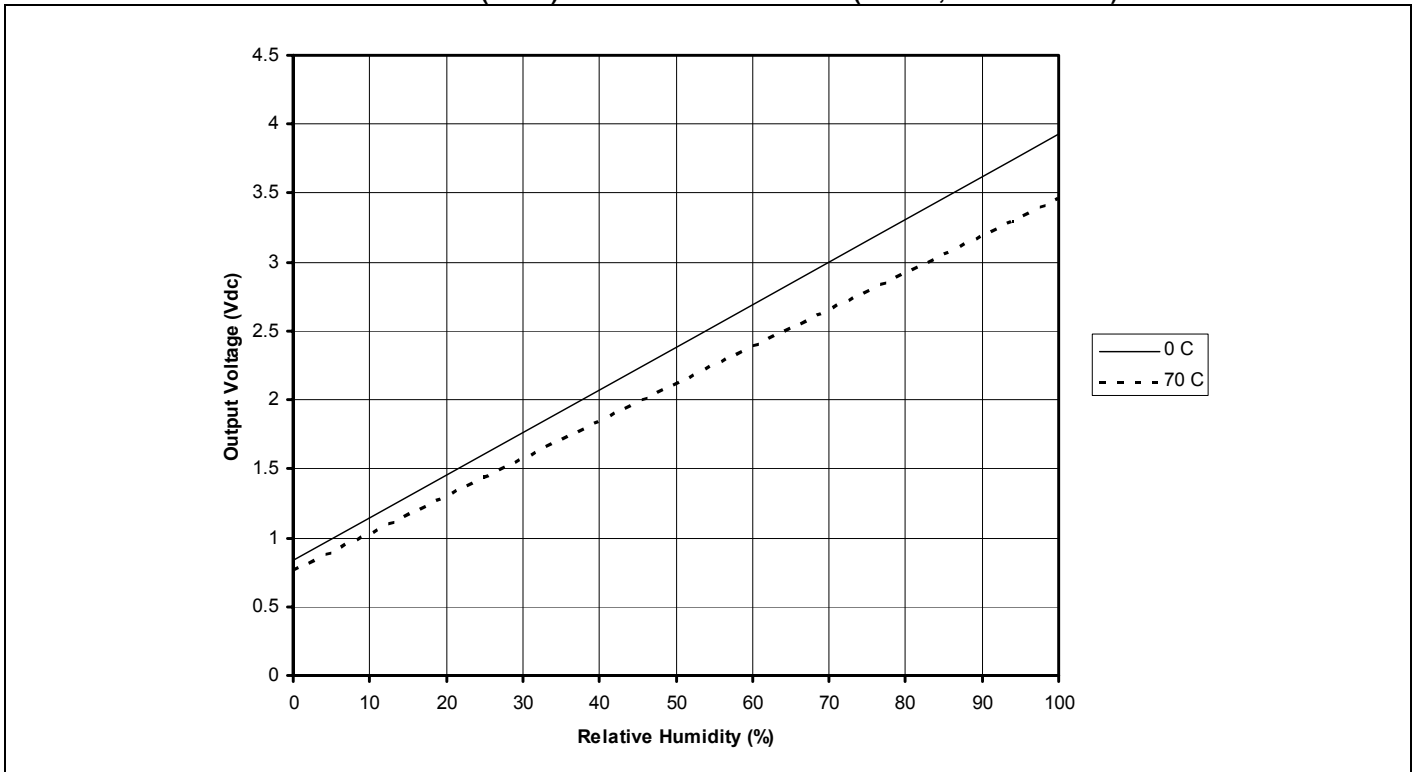
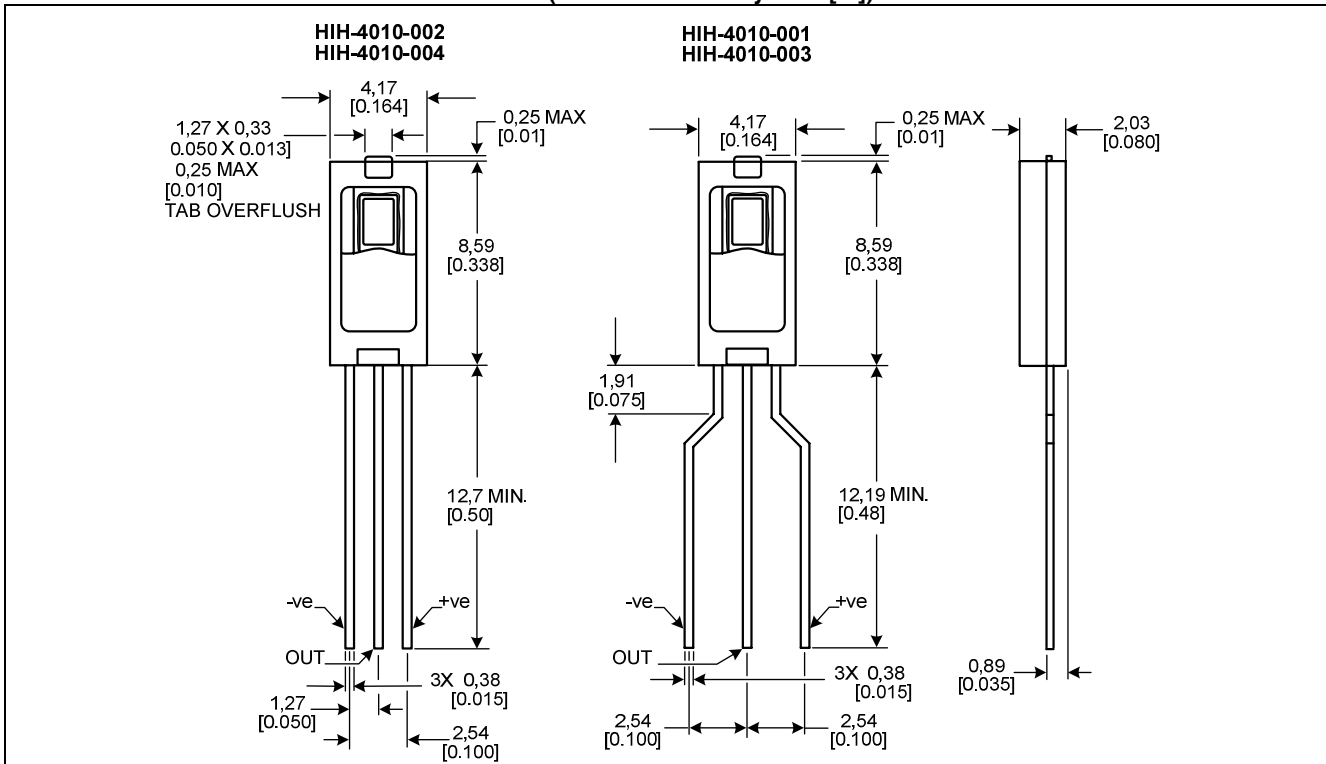


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 °C, 70 °C and 5 V.)

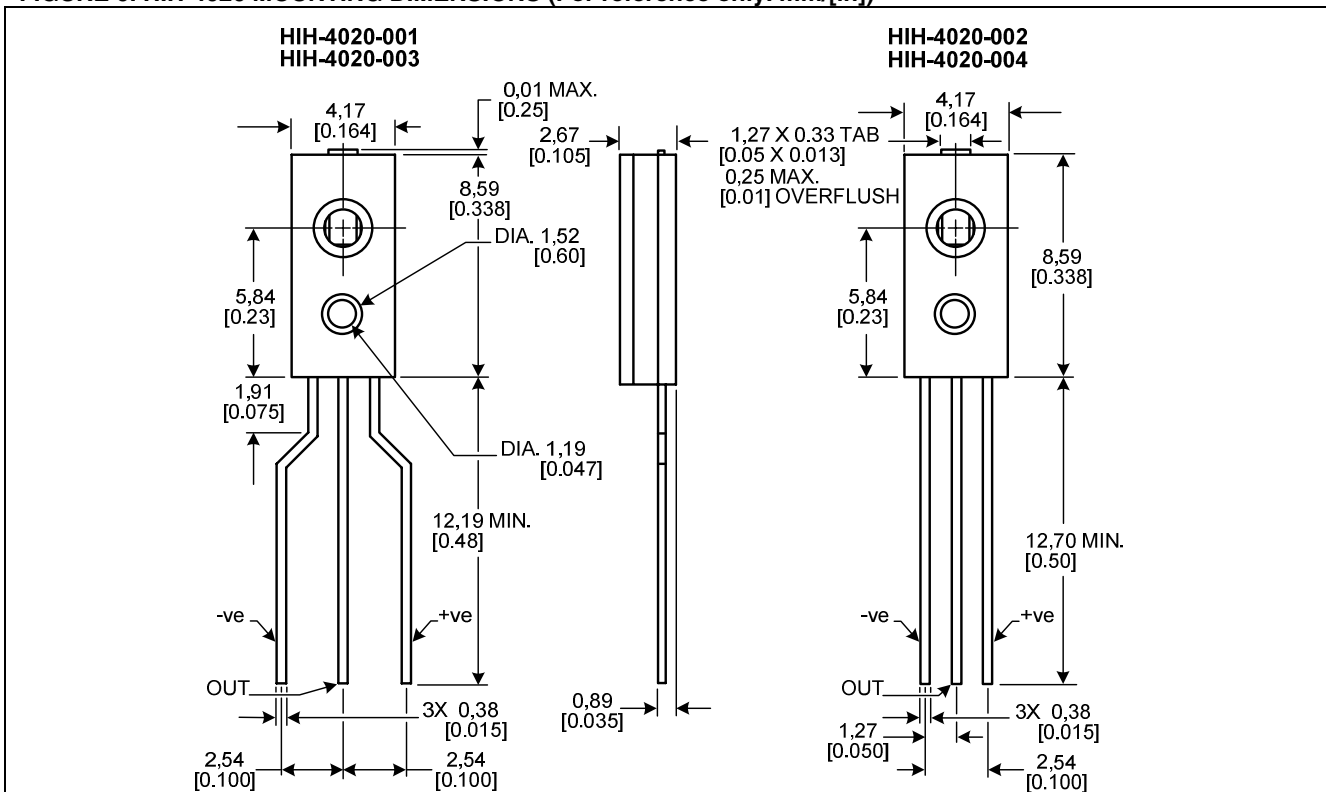


# Humidity Sensors

**FIGURE 5. HIH-4010 MOUNTING DIMENSIONS (For reference only. mm/[in])**

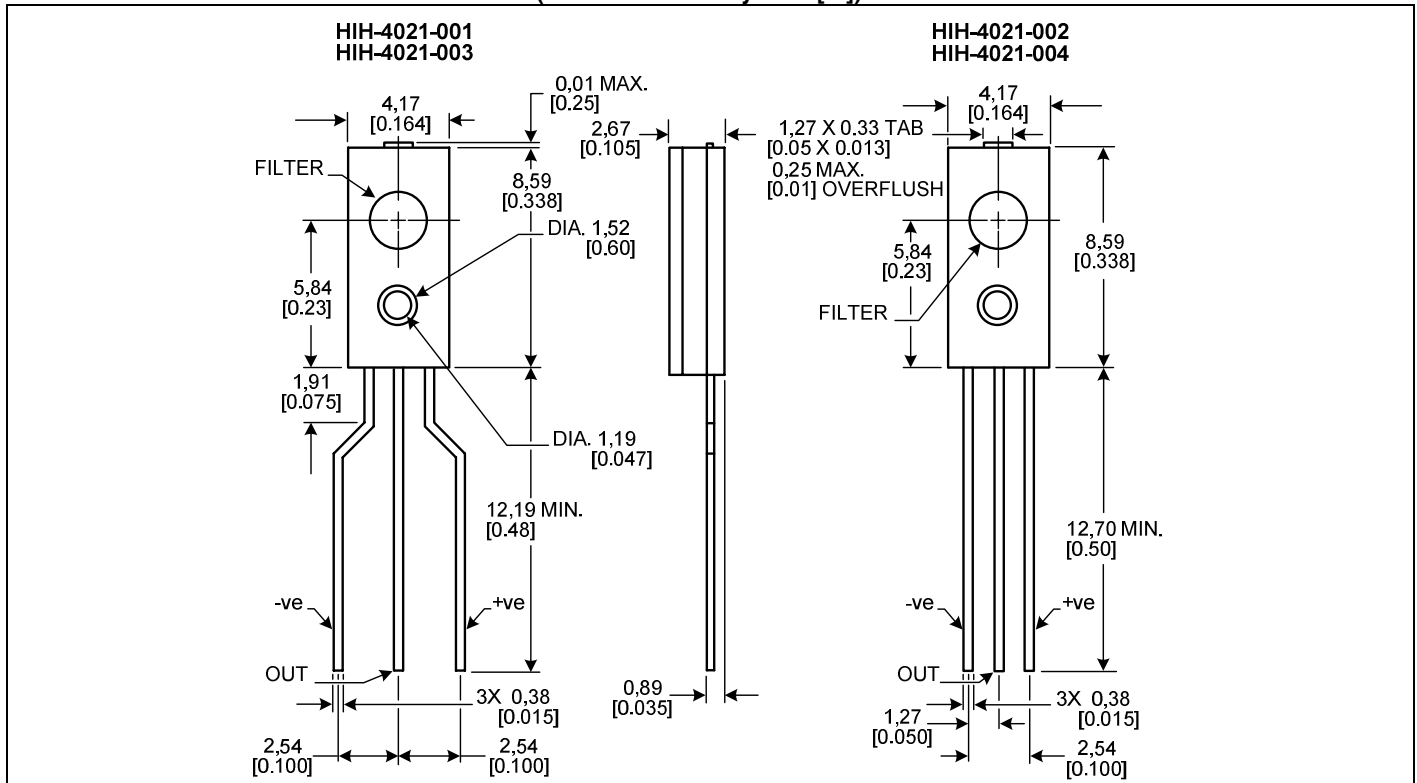


**FIGURE 6. HIH-4020 MOUNTING DIMENSIONS (For reference only. mm/[in])**



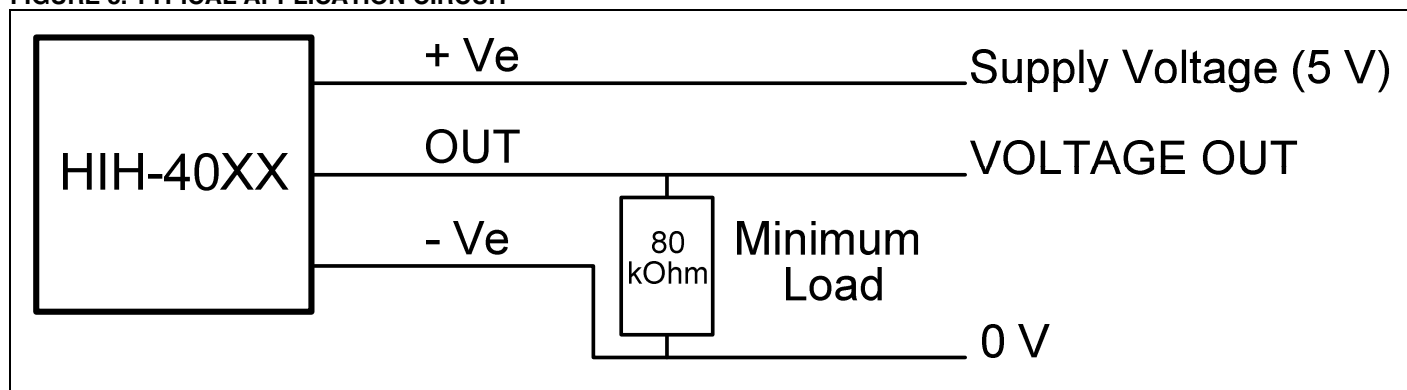
# HIH-4010/4020/4021 Series

FIGURE 7. HIH-4021 MOUNTING DIMENSIONS (For reference only. mm/[in])



# Humidity Sensors

FIGURE 8. TYPICAL APPLICATION CIRCUIT



## ORDER GUIDE

Catalog Listing	Description
HIH-4010-001	Integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP
HIH-4010-002	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP
HIH-4010-003	Integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4010-004	Integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4020-001	Covered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP
HIH-4020-002	Covered integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP
HIH-4020-003	Covered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4020-004	Covered integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP, calibration and data printout
HIH-4021-001	Covered, filtered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP
HIH-4021-002	Covered, filtered integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP
HIH-4021-003	Covered, filtered integrated circuit humidity sensor, 2,45 mm [0.100 in] lead pitch SIP, calibration and data printout
HIH-4021-004	Covered, filtered integrated circuit humidity sensor, 1,27 mm [0.050 in] lead pitch SIP, calibration and data printout

## FURTHER HUMIDITY SENSOR INFORMATION

See the following associated literature at [www.honeywell.com/sensing](http://www.honeywell.com/sensing):

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

## **WARNING**

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### **WARRANTY/REMEDY**

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While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

### **Automation and Control Solutions**

Sensing and Control

Honeywell

1985 Douglas Drive North

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[www.honeywell.com/sensing](http://www.honeywell.com/sensing)

009020-1-EN IL50 GLO Printed in USA  
January 2007

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## **WARNING**

### **PERSONAL INJURY**

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### **SALES AND SERVICE**

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office or:

**E-mail:** [info.sc@honeywell.com](mailto:info.sc@honeywell.com)

**Internet:** [www.honeywell.com/sensing](http://www.honeywell.com/sensing)

### **Phone and Fax:**

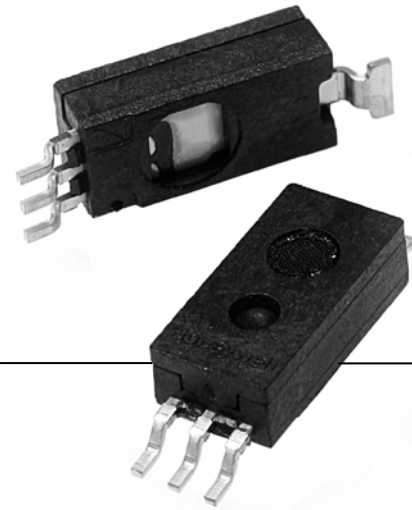
Asia Pacific	+65 6355-2828 +65 6445-3033 Fax
Europe	+44 (0) 1698 481481 +44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188 +1-305-883-8257 Fax
USA/Canada	+1-800-537-6945 +1-815-235-6847 +1-815-235-6545 Fax

# Honeywell



## HIH-4030/31 Series

### Humidity Sensors



#### DESCRIPTION

Honeywell has expanded our HIH Series to include an SMD (Surface Mount Device) product line: the new HIH 4030/4031. The HIH 4030/4031 complements our existing line of non-SMD humidity sensors. SMD packaging on tape and reel allows for use in high volume, automated pick and place manufacturing, eliminating lead misalignment to printed circuit board through-hole.

The HIH-4030/4031 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200  $\mu$ A, the HIH-4030/4031 Series is often ideally suited for low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs. Individual sensor calibration data is available.

#### FEATURES

- Tape and reel packaging allows for use in high volume pick and place manufacturing (1,000 units per tape and reel)
- Molded thermoset plastic housing
- Near linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

The HIH-4030/4031 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SMD.

The HIH-4030 is a covered integrated circuit humidity sensor. The HIH-4031 is a covered, condensation-resistant, integrated circuit humidity sensor that is factory-fitted with a hydrophobic filter allowing it to be used in condensing environments including industrial, medical and commercial applications.

The RH sensor uses a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as condensation, dust, dirt, oils and common environmental chemicals.

Sample packs are available. See order guide.

#### POTENTIAL APPLICATIONS

- Refrigeration equipment
- HVAC (Heating, Ventilation and Air Conditioning) equipment
- Medical equipment
- Drying
- Metrology
- Battery-powered systems
- OEM assemblies

# HIH-4030/31 Series

**TABLE 1. PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)**

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysteresis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH in a year)	–	±1.2	–	% RH	2
Stability (at 50% RH in a year)	–	±0.5	–	% RH	3
Voltage supply	4	–	5.8	Vdc	4
Current supply	–	200	500	µA	–
Voltage output (1 <sup>st</sup> order curve fit)	$V_{OUT} = (V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$ , typical at 25 °C				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in °C				
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity (HIH-4030)	0	See Figure 1.	100	% RH	5
Operating humidity (HIH-4031)	0	See Figure 1.	100	% RH	–
Storage temperature	-50[-58]	–	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	5

**Specific Notes:**

1. Can only be achieved with the supplied slope and offset. For HIH-4030/31-003 catalog listings only.
2. Includes testing outside of recommended operating zone.
3. Includes testing for recommended operating zone only.
4. Device is calibrated at 5 Vdc and 25 °C.
5. Non-condensing environment. When liquid water falls on the humidity sensor die, output goes to a low rail condition indicating no humidity.

**General Notes:**

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

**FACTORY CALIBRATION DATA**

HIH-4030/31 Sensors may be ordered with a calibration and data printout. See Table 2 and the order guide on the back page.

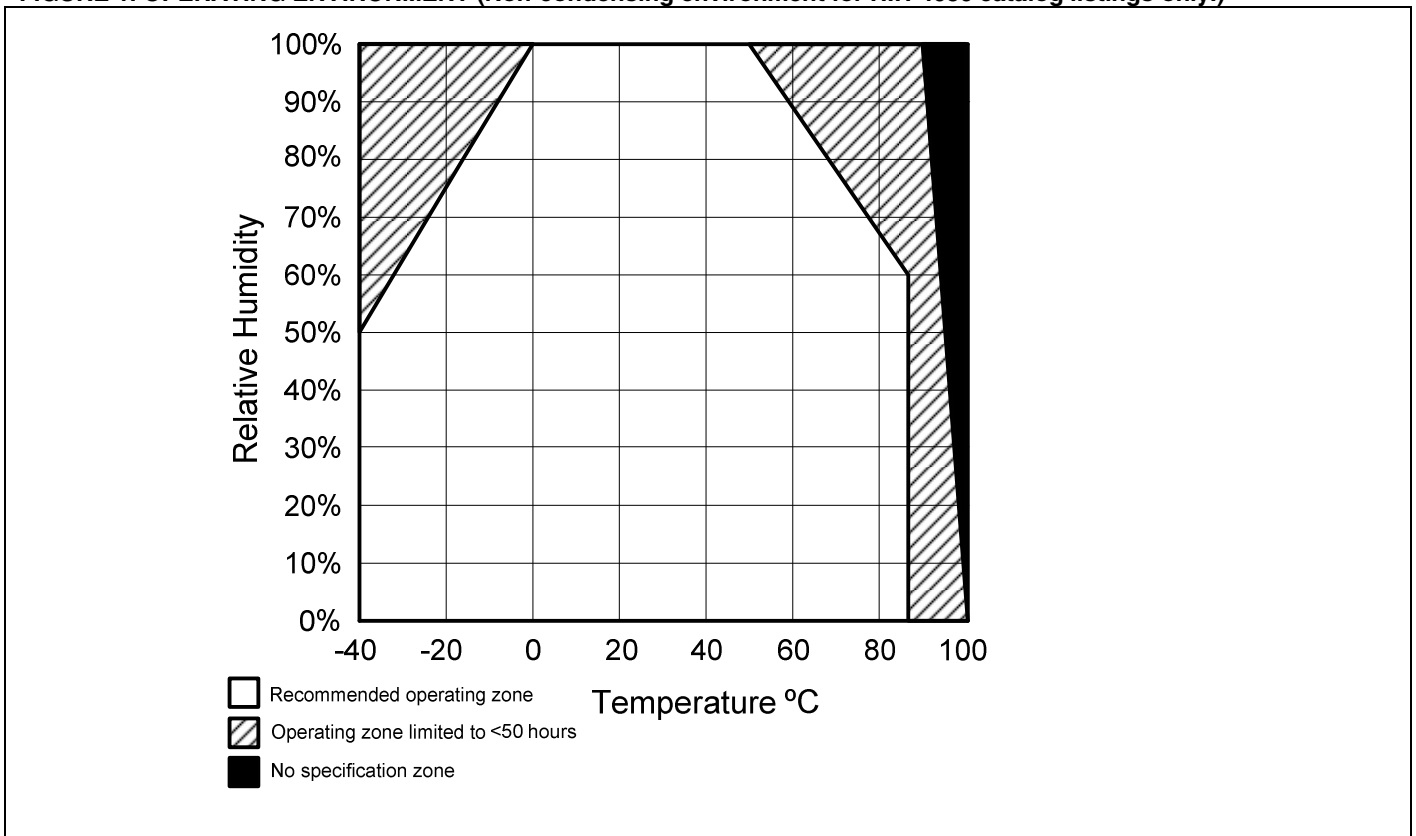
**TABLE 2. EXAMPLE DATA PRINTOUT**

<b>Model</b>	<b>HIH-4030-003</b>
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V	
V <sub>OUT</sub> at 0% RH	0.958 V
V <sub>OUT</sub> at 75.3% RH	3.268 V
Linear output for 3.5% RH accuracy at 25 °C	
Zero offset	0.958 V
Slope	30.680 mV/%RH
Sensor RH	(V <sub>OUT</sub> - zero offset)/slope (V <sub>OUT</sub> - 0.958)/0.0307
Ratiometric response for 0% RH to 100% RH	
V <sub>OUT</sub>	V <sub>SUPPLY</sub> (0.1915 to 0.8130)

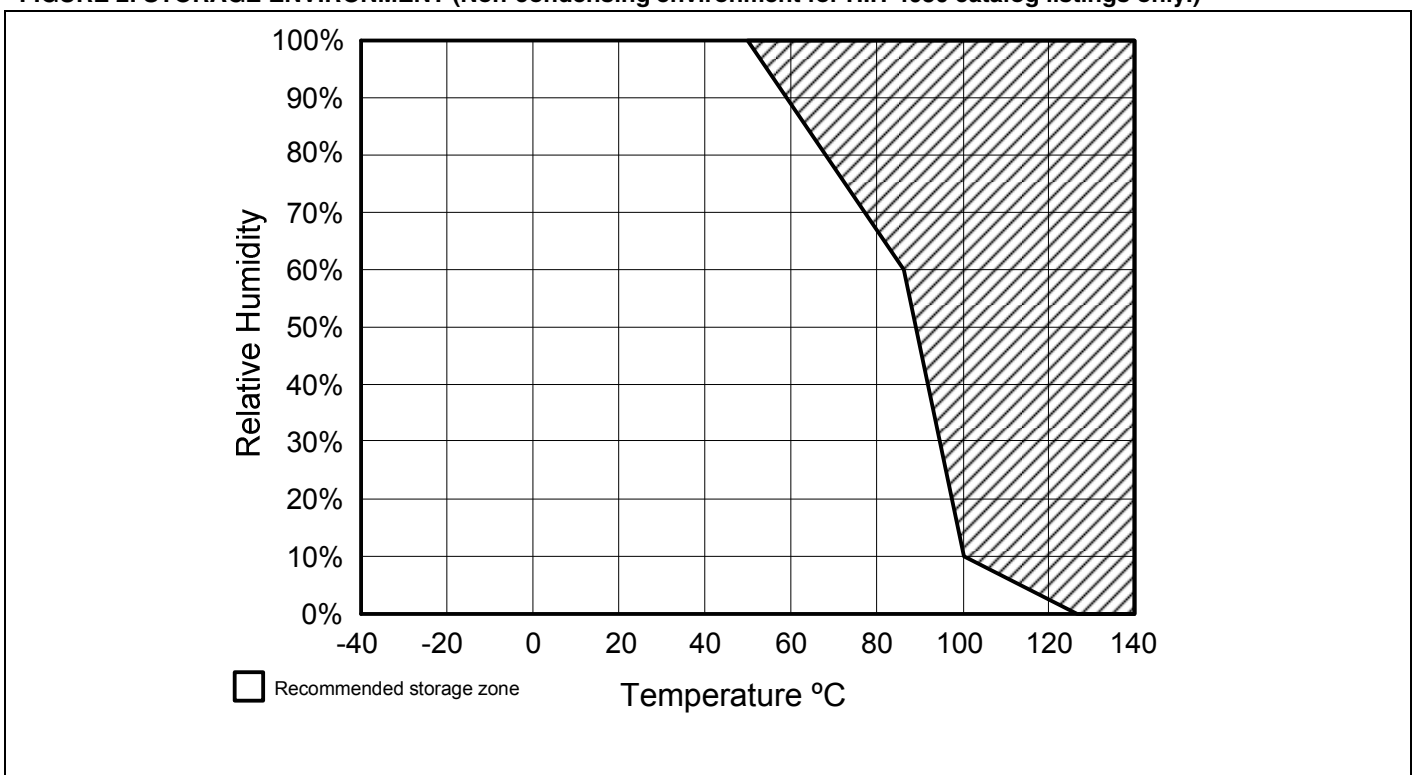


# Humidity Sensors

**FIGURE 1. OPERATING ENVIRONMENT (Non-condensing environment for HIH-4030 catalog listings only.)**



**FIGURE 2. STORAGE ENVIRONMENT (Non-condensing environment for HIH-4030 catalog listings only.)**



# HIH-4030/31 Series

FIGURE 3. TYPICAL OUTPUT VOLTAGE VS RELATIVE HUMIDITY (At 25 °C and 5 V.)

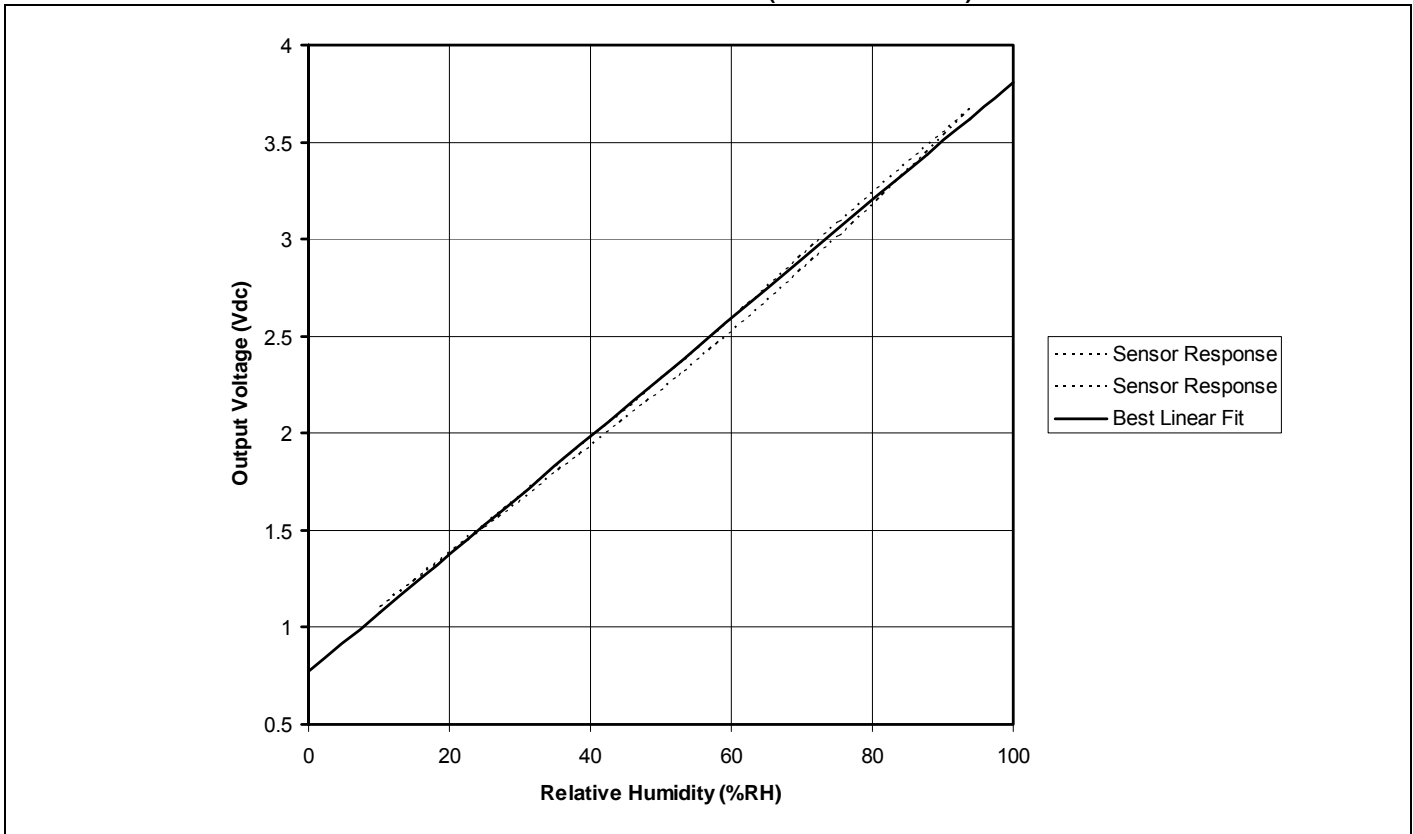
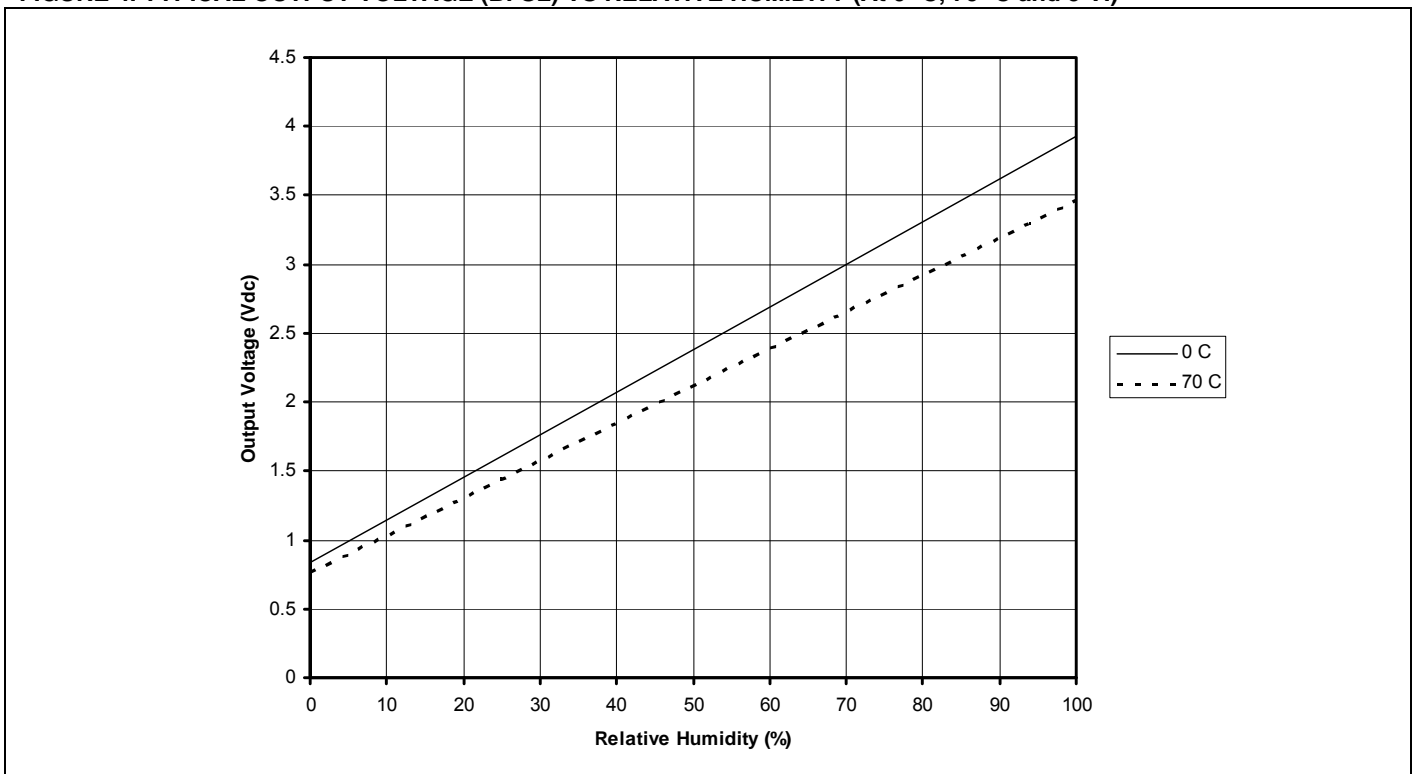


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 °C, 70 °C and 5 V.)





# HIH-4030/31 Series

FIGURE 6. HIH-4031 MOUNTING DIMENSIONS (For reference only. mm/[in])

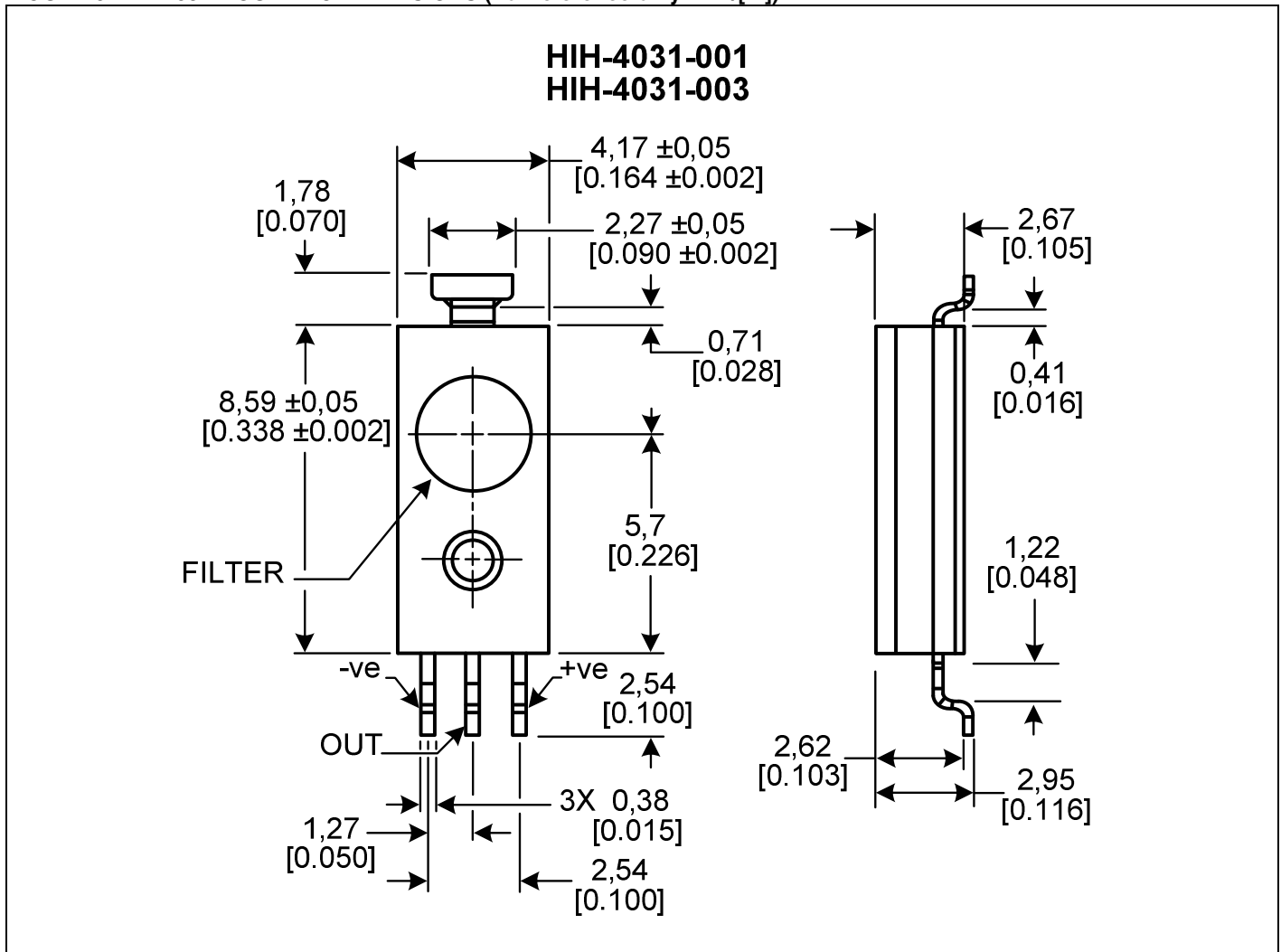
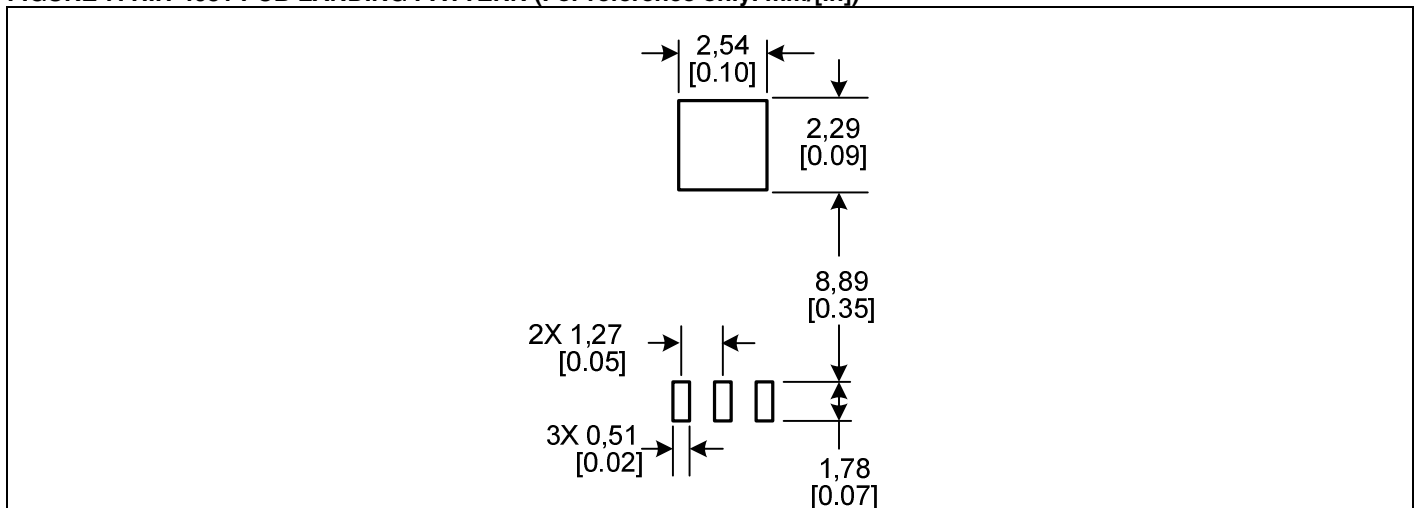
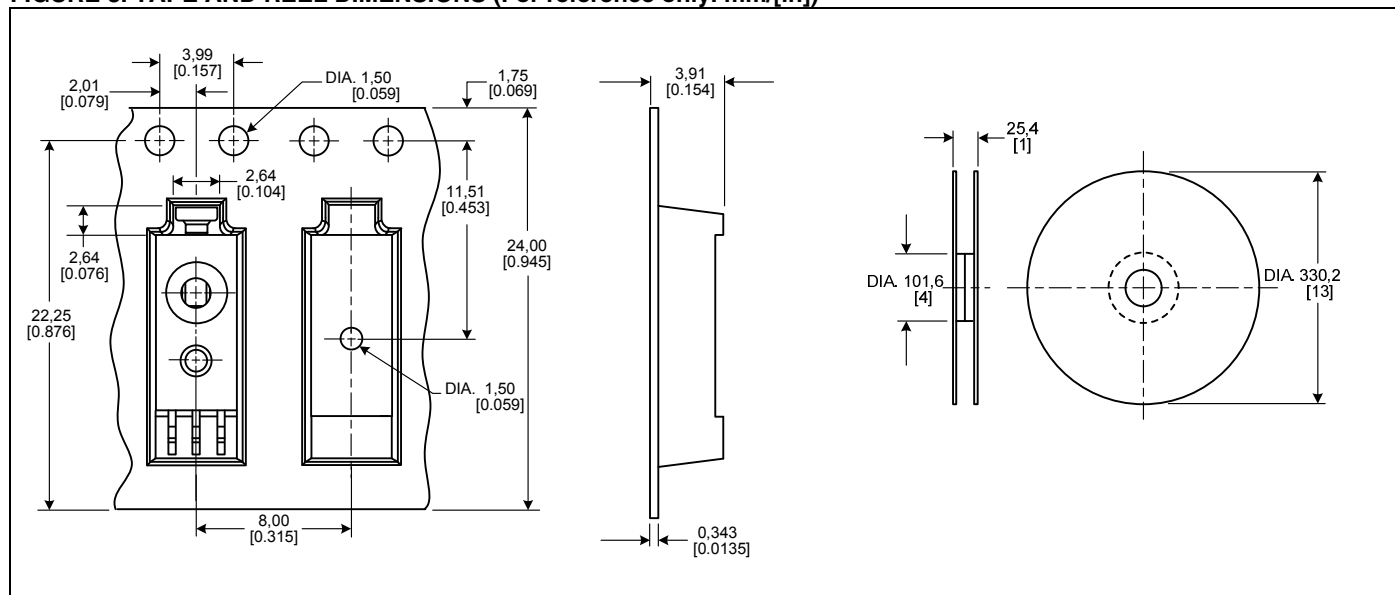


FIGURE 7. HIH-4031 PCB LANDING PATTERN (For reference only. mm/[in])

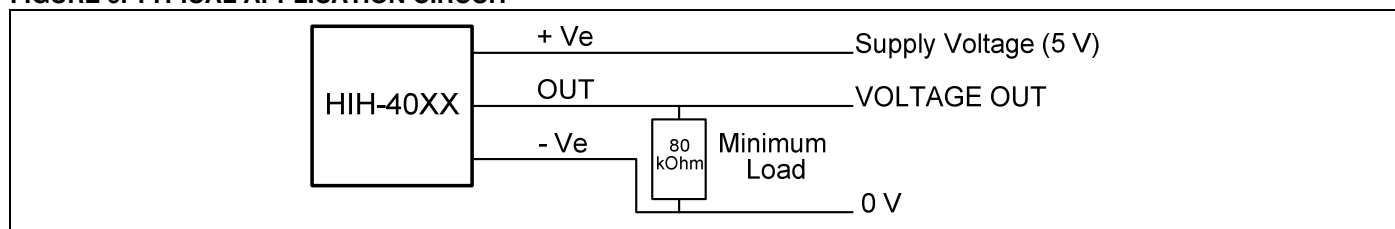


# Humidity Sensors

**FIGURE 8. TAPE AND REEL DIMENSIONS (For reference only. mm/[in])**



**FIGURE 9. TYPICAL APPLICATION CIRCUIT**



**ORDER GUIDE**

Catalog Listing	Description
HIH-4030-001	Covered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-4030-003	Covered integrated circuit humidity sensor, SMD, calibration and data printout, 1000 units on tape and reel
HIH-4031-001	Covered, filtered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-4031-003	Covered, filtered integrated circuit humidity sensor, SMD, calibration and data printout, 1000 units on tape and reel
HIH-4030-001S	Sample pack: covered integrated circuit humidity sensor, SMD, five units on tape
HIH-4030-003S	Sample pack: covered integrated circuit humidity sensor, SMD, calibration and data printout, five units on tape
HIH-4031-001S	Sample pack: covered, filtered integrated circuit humidity sensor, SMD, sample pack, five units on tape
HIH-4031-003S	Sample pack: covered, filtered integrated circuit humidity sensor, SMD, calibration and data printout, five units on tape

**FURTHER HUMIDITY SENSOR INFORMATION**

See the following associated literature is available on the [Web](#):

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

## **WARNING**

### **MISUSE OF DOCUMENTATION**

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- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

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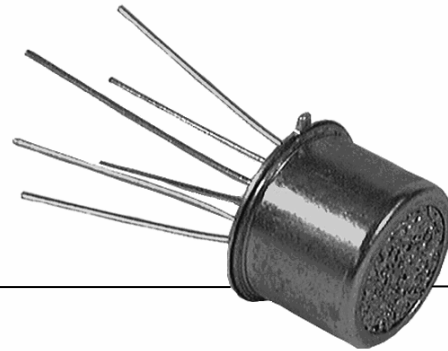
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March 2008  
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# Honeywell



## HIH-4602-A/C Series

### Humidity Sensors



#### DESCRIPTION

HIH-4602-A/C Series Relative Humidity (RH) sensors combine both relative humidity and temperature sensing in a TO-5 housing with a hydrophobic sintered stainless steel filter.

The laser-trimmed, thermoset polymer capacitive sensing elements have on-chip integrated signal conditioning.

The temperature sensor is thermally connected with the RH sensor making the HIH-4602-A/C often ideal for measuring dew point and other absolute moisture terms.

#### FEATURES

- Near linear voltage output vs %RH
- Laser-trimmed interchangeability
- Enhanced accuracy, fast response
- Chemically resistant
- Stable, low drift performance
- Built-in static protection
- Often ideal for dew point and absolute moisture measurements
- TO-5 housing

The HIH-4602-A contains an integral thermistor, while the HIH-4602-C contains an integral precision RTD.

Factory calibration data supplied with each sensor allows individually matched downstream electronics and  $\pm 3.5$  %RH total accuracy.

#### POTENTIAL APPLICATIONS

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM (Original Equipment Manufacturer) assemblies

# HIH-4602-A/C Series

**TABLE 1. PERFORMANCE SPECIFICATIONS (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)**

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysteresis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	50	–	s	–
Stability (at 50% RH in one year)	–	±1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	–
Current supply	–	200	500	µA	–
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$ , typical at 25 °C				
Temperature compensation	True RH = (sensor RH)/(1.0546-0.00216T), T in °C				
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity	0	See Figure 1.	100	% RH	2
Storage temperature	-50[-58]	–	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	2

**Specific Notes:**

1. Device is calibrated at 5 Vdc and 25 °C.
2. Non-condensing environment.

**General Notes:**

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

**FACTORY CALIBRATION DATA**

HIH-4602 Sensors are supplied with a calibration and data printout. See Table 2.

**TABLE 2. EXAMPLE DATA PRINTOUT**

Model	HIH-4602-C
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V	
V <sub>OUT</sub> at 0% RH	0.826 V
V <sub>OUT</sub> at 75.3% RH	3.198 V
Linear output for 3.5% RH accuracy at 25 °C	
Zero offset	0.826 V
Slope	31.483 mV/%RH
RH	(V <sub>OUT</sub> - zero offset)/slope (V <sub>OUT</sub> - 0.826)/0.0315
Ratiometric response for 0% RH to 100% RH	
V <sub>OUT</sub>	V <sub>SUPPLY</sub> (0.1652 to 0.7952)

**TABLE 3. HIH-4602-A NTC THERMISTOR TEMPERATURE SPECIFICATIONS**

R <sub>b</sub> = 100 kOhm ±5% at 25 °C		
Beta = 4250, 25 °C to 85 °C		
1/T = a + b(Ln R) + c(Ln R) ^ 3, T in degrees K		
	<b>Temp. °C</b>	<b>Resistance</b>
Low	0	351000
Mid	50	33590
High	100	5569
a = 0.000828083		
b = 0.000208691		
c = 8.0812E-08		

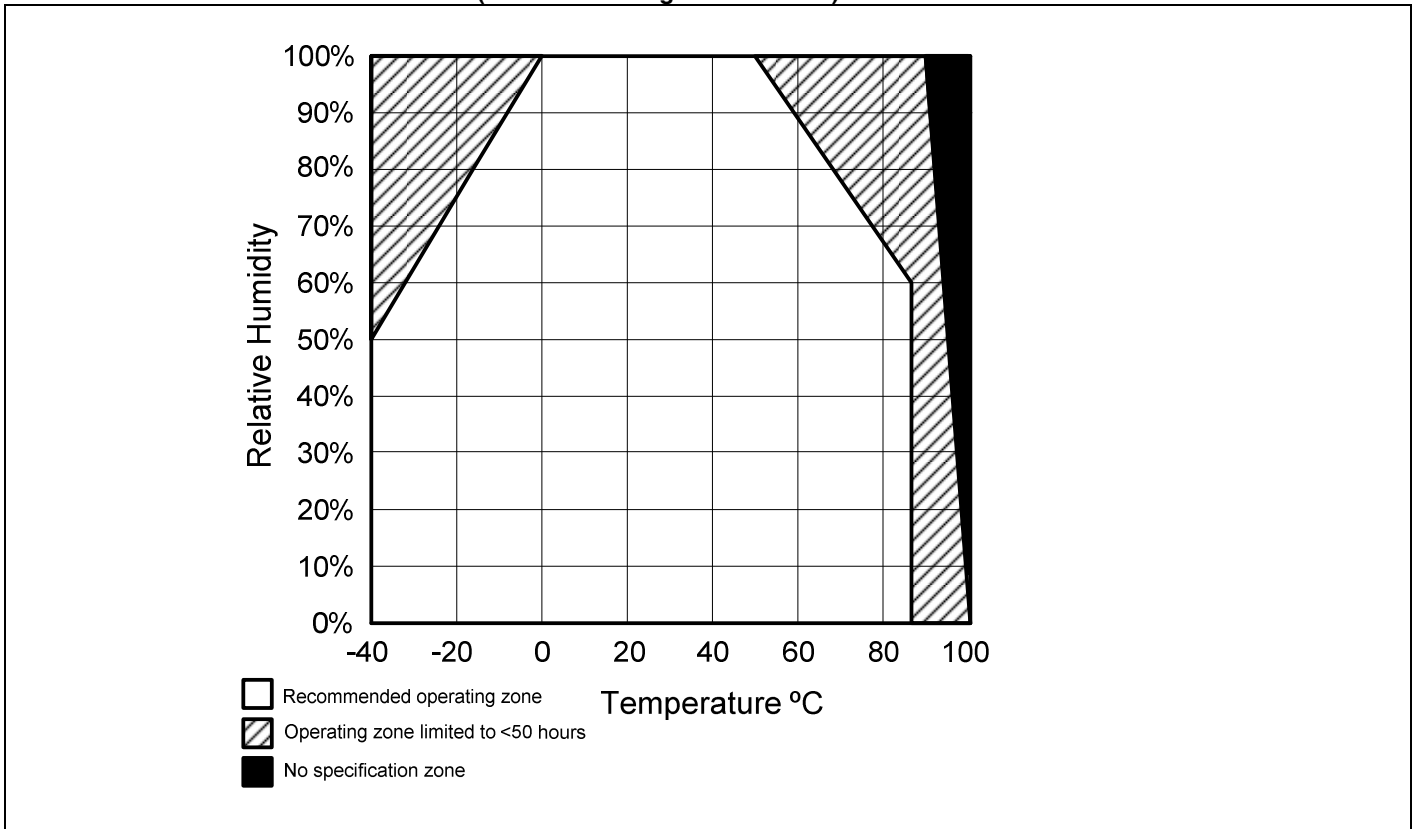
**TABLE 4. HIH-4602-C RTD TEMPERATURE SENSOR SPECIFICATIONS**

Thin film platinum RTD – Class 2B (Ro: ±0.25%)
DIN EN 60571 (PER IEC 751)
TCR = 3750 ppm/°C
1000 Ohm at 0 °C [32 °F]

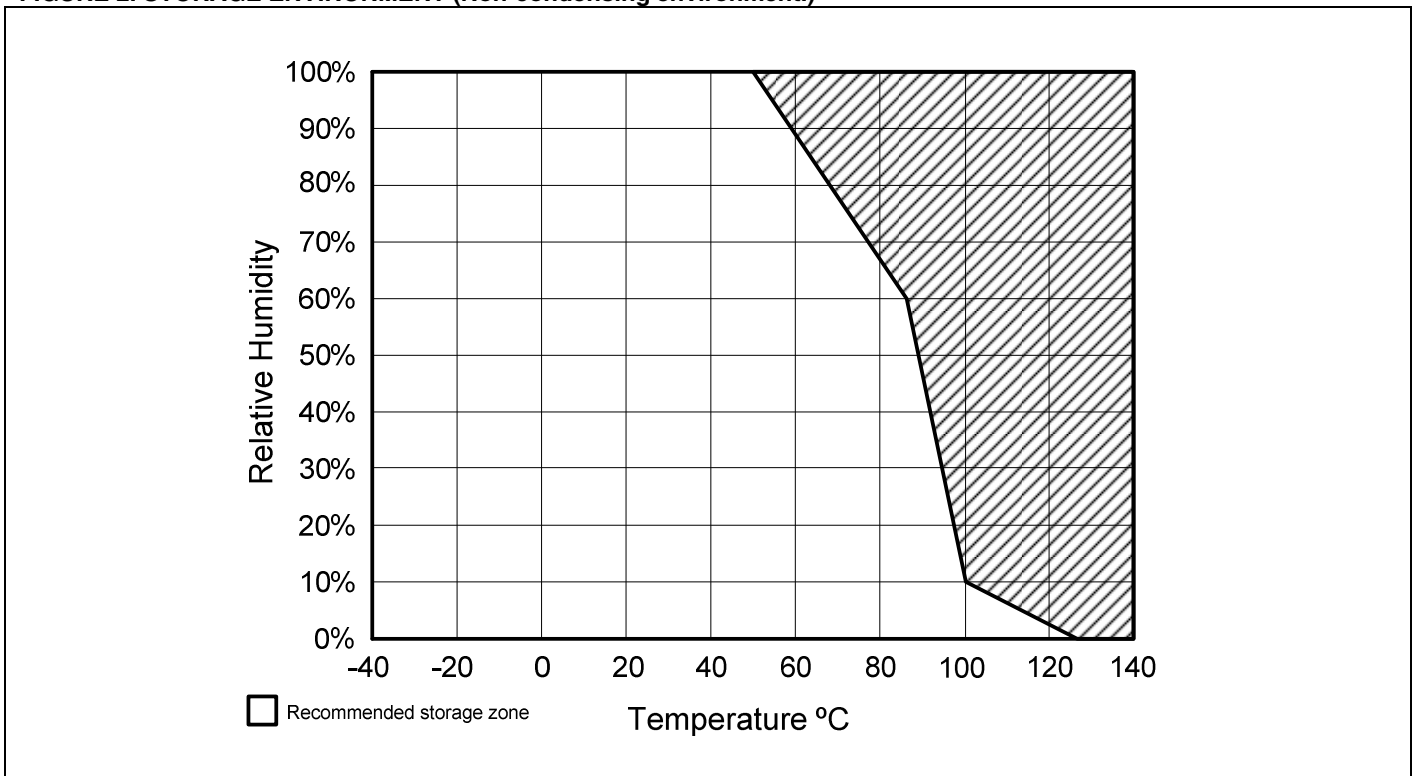


# Humidity Sensors

**FIGURE 1. OPERATING ENVIRONMENT (Non-condensing environment.)**



**FIGURE 2. STORAGE ENVIRONMENT (Non-condensing environment.)**



# HIH-4602-A/C Series

FIGURE 3. TYPICAL OUTPUT VOLTAGE VS RELATIVE HUMIDITY (At 25 °C and 5 V.)

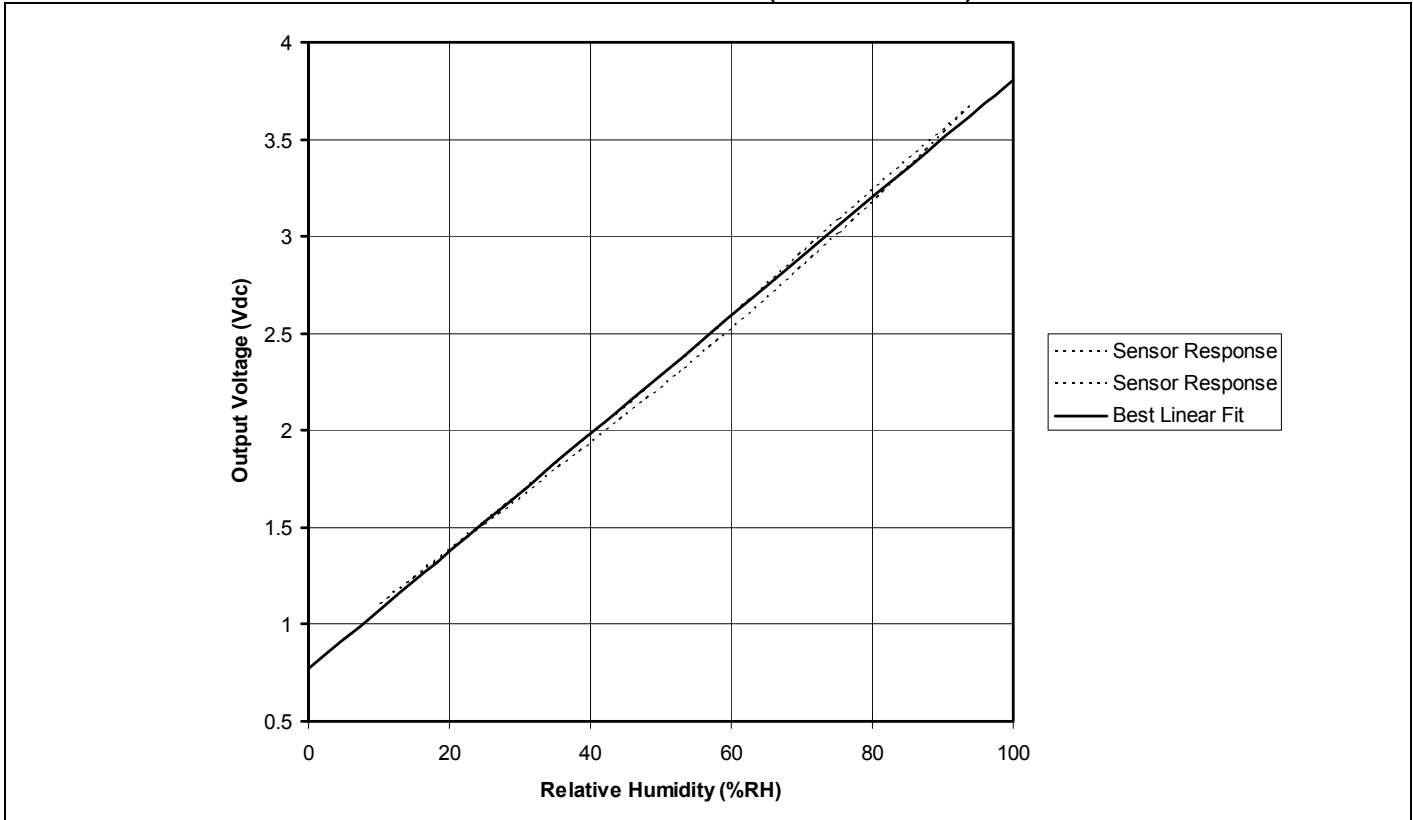
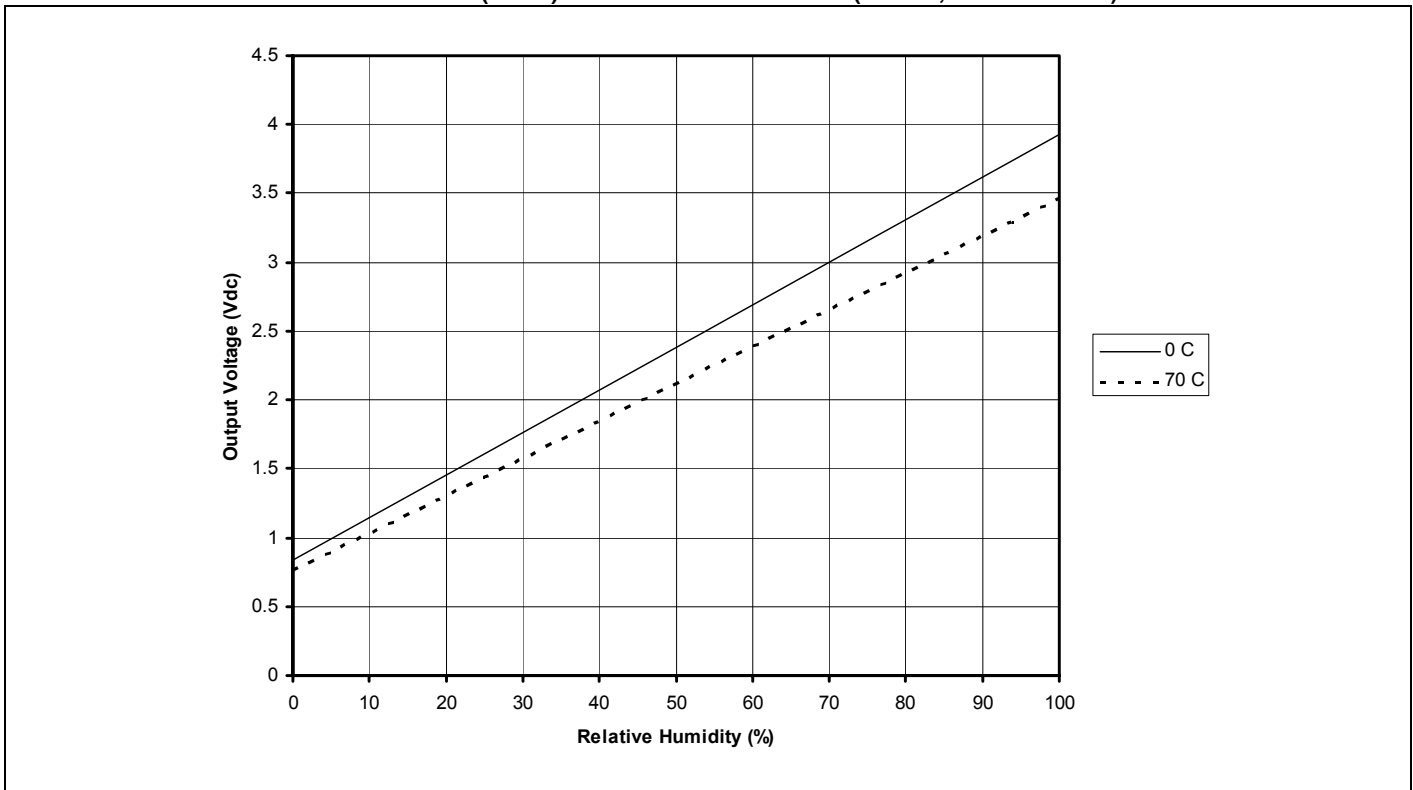
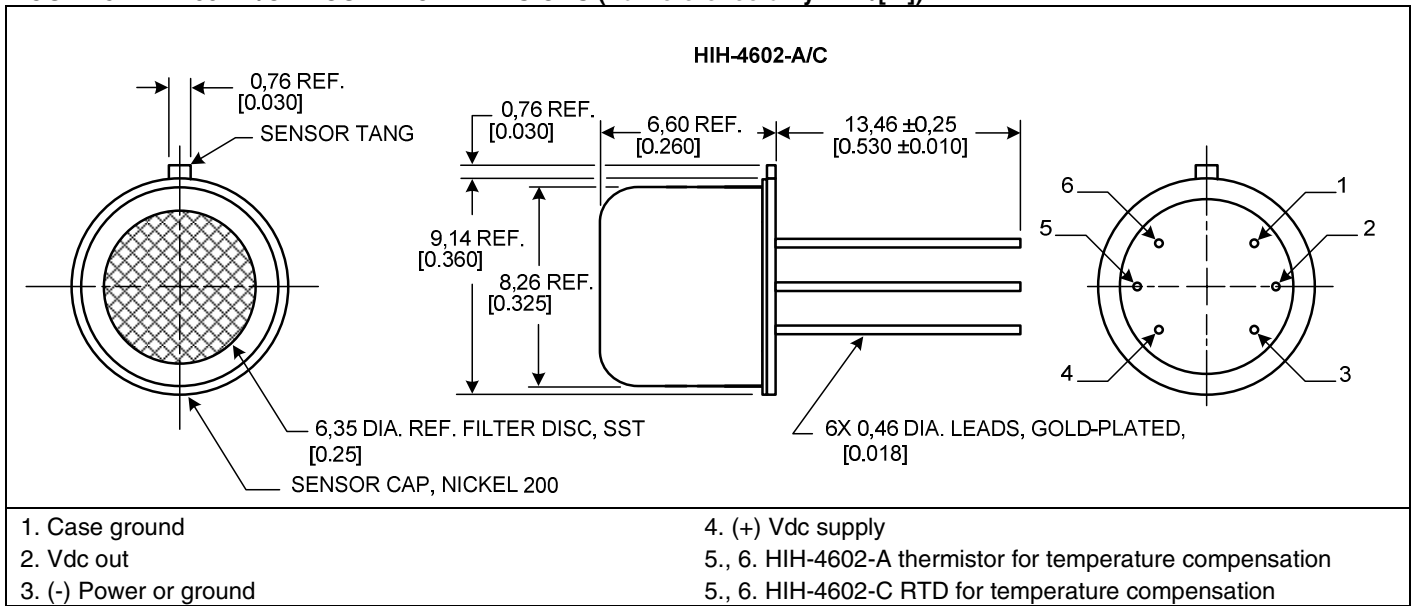


FIGURE 4. TYPICAL OUTPUT VOLTAGE (BFSL) VS RELATIVE HUMIDITY (At 0 °C, 70 °C and 5 V.)



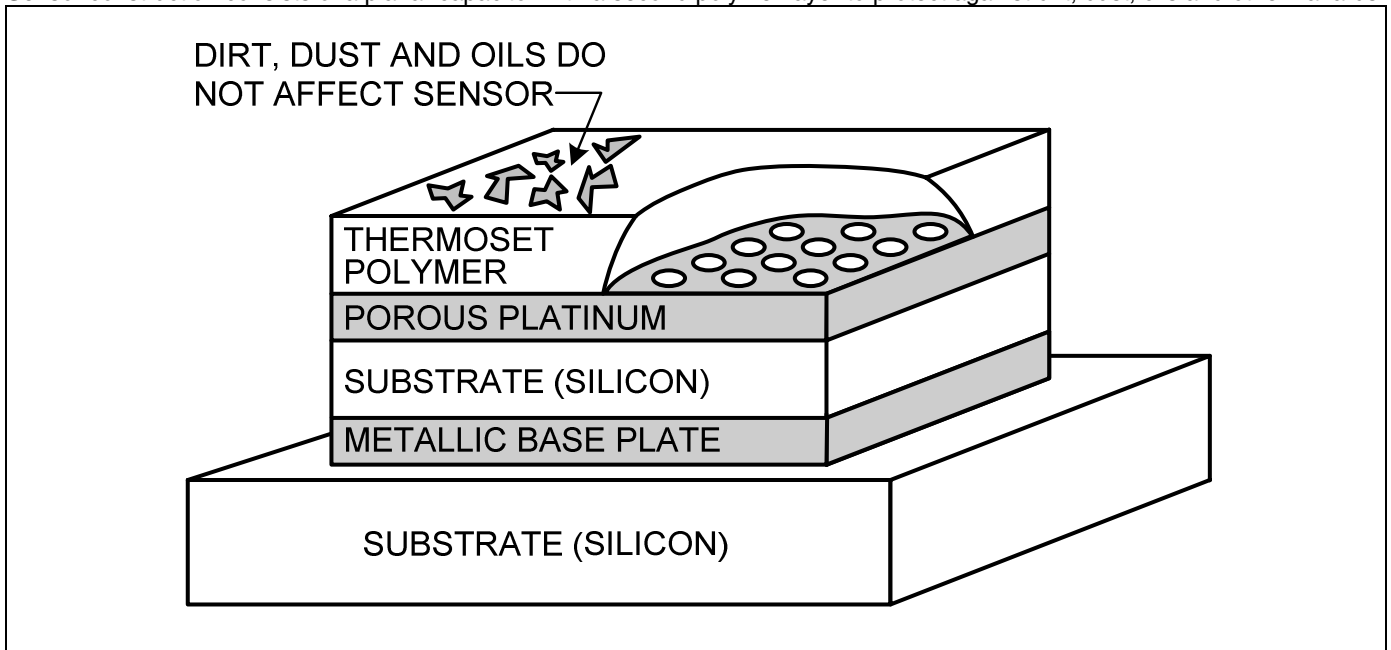
# Humidity Sensors

**FIGURE 5. HIH-4602-A/C 1 MOUNTING DIMENSIONS (For reference only. mm/[in])**



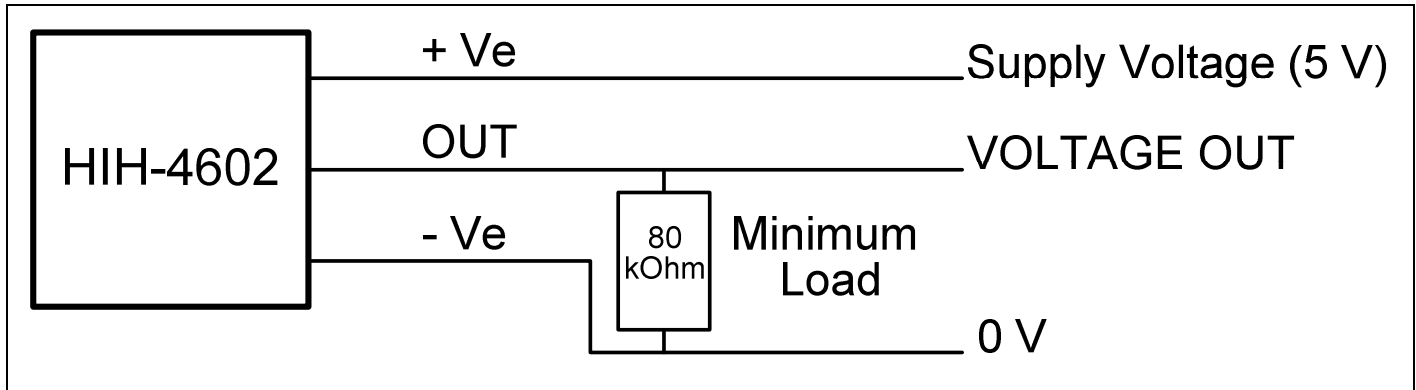
**FIGURE 6. RH SENSOR CONSTRUCTION**

Sensor construction consists of a planar capacitor with a second polymer layer to protect against dirt, dust, oils and other hazards.



# HIH-4602-A/C Series

FIGURE 7. TYPICAL APPLICATION CIRCUIT



## ORDER GUIDE

Catalog Listing	Description
HIH-4602-A	Monolithic IC humidity sensor with integral thermistor in TO-5 can
HIH-4602-C	Monolithic IC humidity sensor with integral precision RTD in TO-5 can

## FURTHER HUMIDITY SENSOR INFORMATION

See the following associated literature at [www.honeywell.com/sensing](http://www.honeywell.com/sensing):

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

# Humidity Sensors

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January 2007

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# Honeywell



## HIH-4602-L Series Humidity Sensors



### DESCRIPTION

HIH-4602-L Series Relative Humidity (RH) sensors are designed to deliver RH sensing in a rugged, low-cost slotted TO-5 can.

The laser-trimmed, thermoset polymer capacitive sensing elements have on-chip integrated signal conditioning, helping to reduce product development times.

### FEATURES

---

- Near linear voltage output vs %RH
- Laser-trimmed interchangeability
- Enhanced accuracy, fast response
- Chemically resistant
- Stable, low drift performance
- Built-in static protection
- TO-5 can

A typical current draw of only 200  $\mu$ A allows use in battery-powered systems.

HIH-4602-L-CP sensors include a calibration and data printout to allow individually matched downstream electronics and  $\pm 3.5$  %RH total accuracy.

### POTENTIAL APPLICATIONS

---

- Refrigeration
- Drying
- Meteorology
- Battery-powered systems
- OEM (Original Equipment Manufacturer) assemblies

# HIH-4602-L Series

**Table 1. Performance Specifications (At 5 Vdc supply and 25 °C [77 °F] unless otherwise noted.)**

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve)	–	–	–	–	–
0% RH to 59% RH	-5	–	5	% RH	–
60% RH to 100% RH	-8	–	8	% RH	–
Accuracy (best fit straight line)	-3.5	–	+3.5	% RH	1
Hysteresis	–	3	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	30	–	s	–
Stability (at 50% RH in one year)	–	1.2	–	% RH	–
Voltage supply	4	–	5.8	Vdc	–
Current supply	–	200	500	µA	–
Output voltage temp. coefficient at 50% RH, 5 V	–	-4	–	mV/°C	–
Voltage output (1st order curve fit)	$V_{OUT} = (V_{SUPPLY})(0.0062(\text{sensor RH}) + 0.16)$ , typical at 25 °C				2
Temperature compensation	True RH = (sensor RH)/(1.0546-0.00216T), T in °C				
Operating temperature	-40[-40]	See Figure 1.	85[185]	°C[°F]	–
Operating humidity	0	See Figure 1.	100	% RH	3
Storage temperature	-40[-40]	See Figure 2.	125[257]	°C[°F]	–
Storage humidity	See Figure 2.			% RH	3

**Specific Notes:**

1. Applies to HIH-4602-L-CP only.
2. Device is calibrated at 5 Vdc and 25 °C.
3. Non-condensing environment.

**General Notes:**

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90% RH causes a reversible shift of 3% RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.

**Factory Calibration Data**

HIH-4602-L-CP Sensors include a calibration and data printout. See Table 2.

**Table 2. Example Data Printout**

Model	HIH-4602-L-CP
Channel	92
Wafer	030996M
MRP	337313
Calculated values at 5 V	
V <sub>OUT</sub> at 0% RH	0.958 V
V <sub>OUT</sub> at 75.3% RH	3.268 V
Linear output for 3.5% RH accuracy at 25 °C	
Zero offset	0.958 V
Slope	30.680 mV/%RH
RH	(V <sub>OUT</sub> - zero offset)/slope (V <sub>OUT</sub> - 0.958)/0.0307
Ratiometric response for 0% RH to 100% RH	
V <sub>OUT</sub>	V <sub>SUPPLY</sub> (0.1915 to 0.8130)



# Humidity Sensors

Figure 1. Operating Environment (Non-condensing environment.)

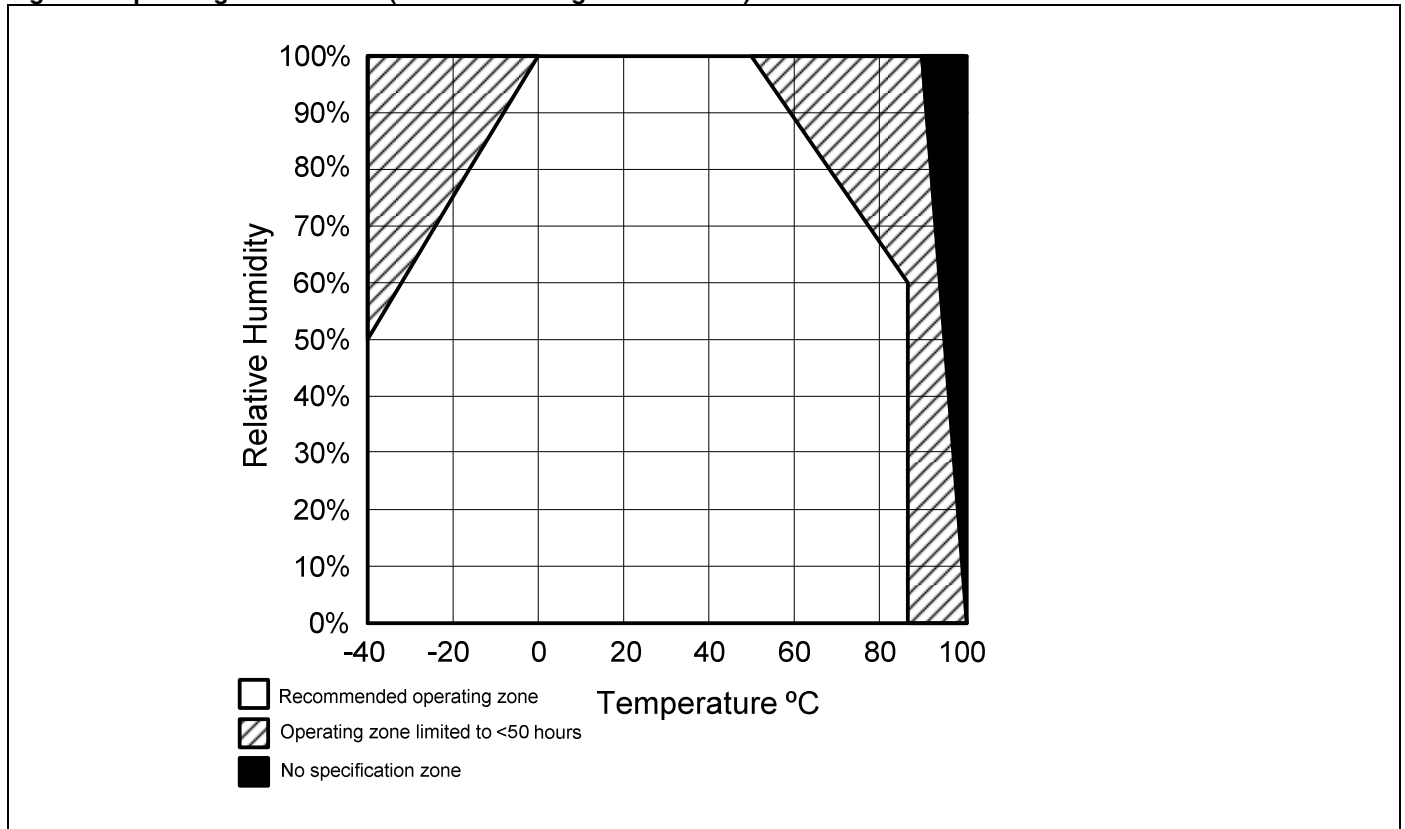
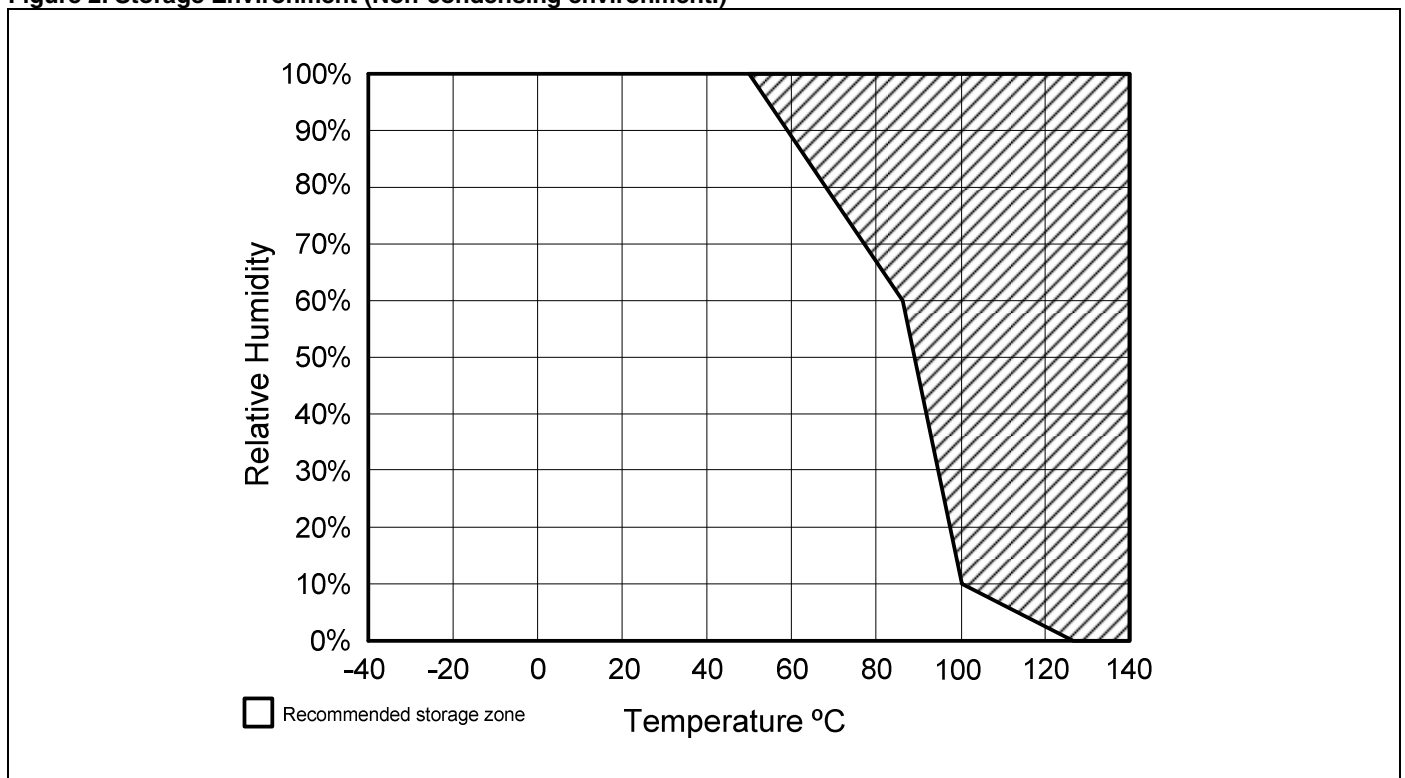


Figure 2. Storage Environment (Non-condensing environment.)



# HIH-4602-L Series

Figure 3. Typical Output Voltage vs Relative Humidity (At 5 V and 25 °C.)

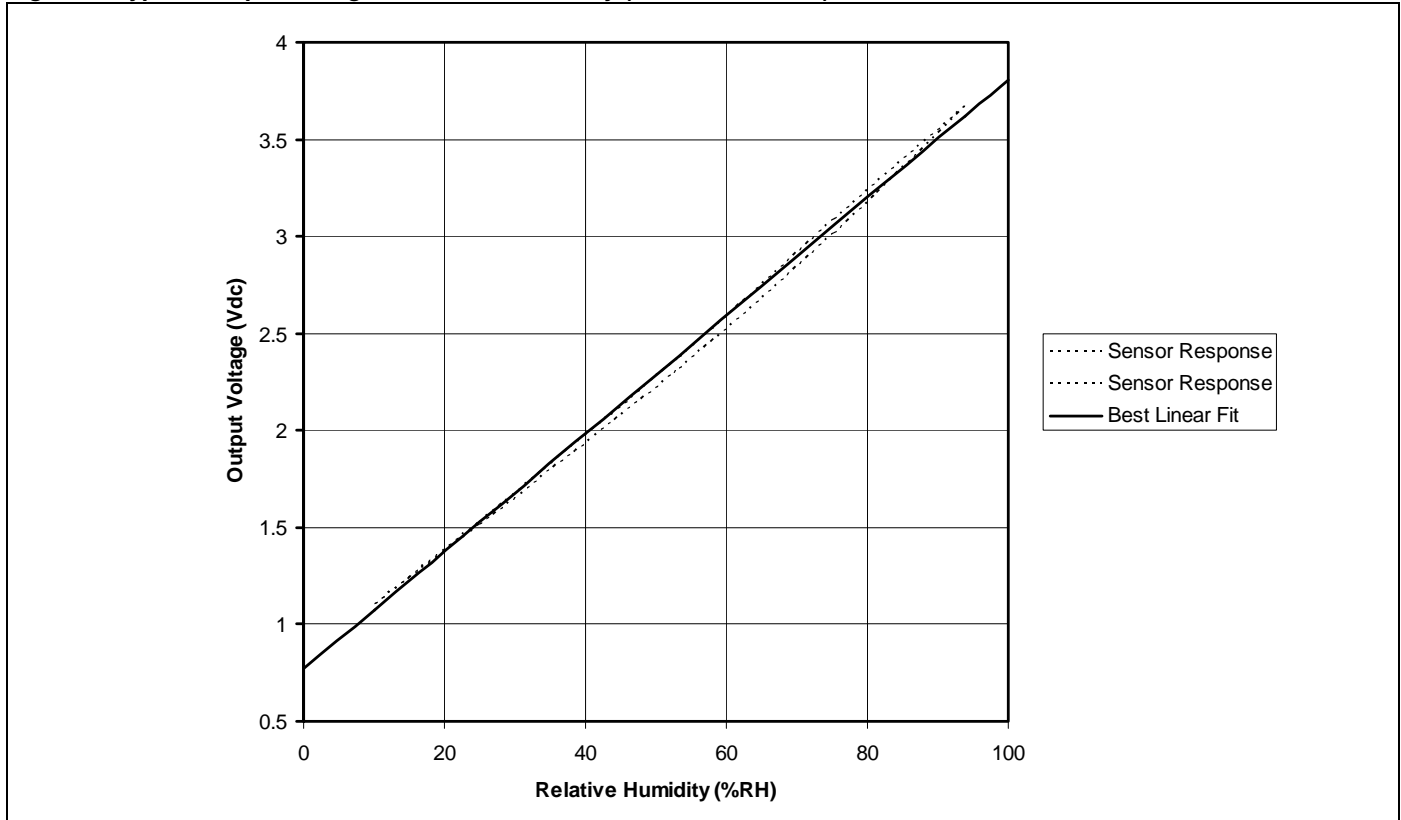
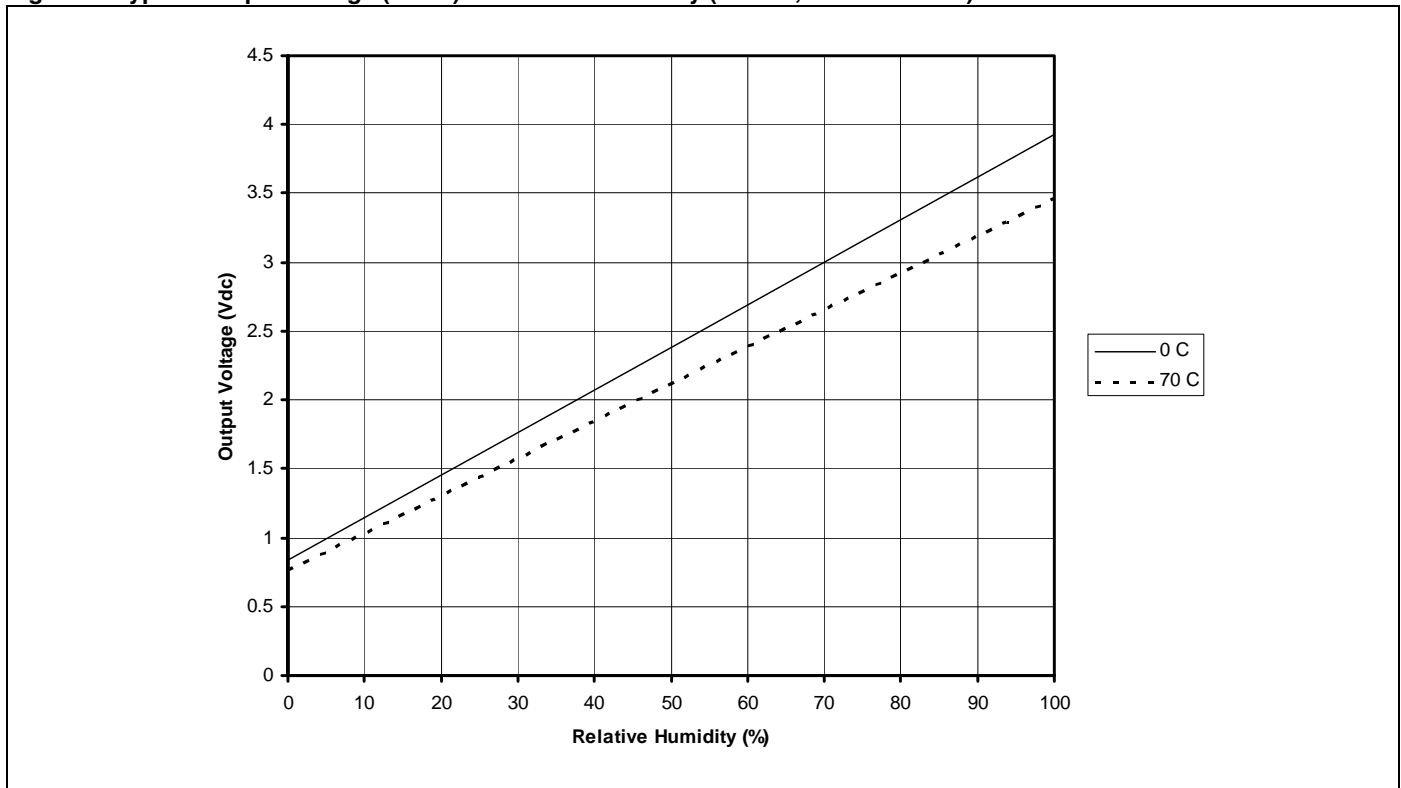
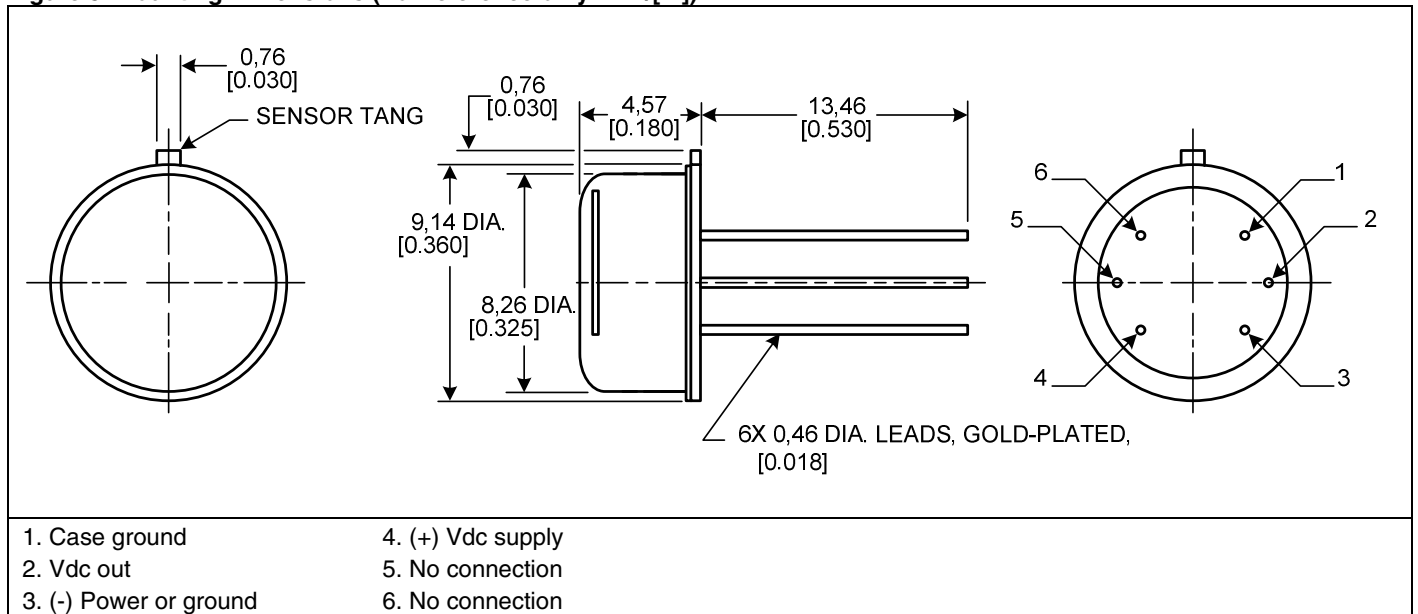


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 °C, 70 °C and 5 V.)



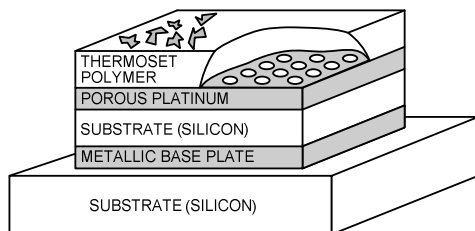
# Humidity Sensors

**Figure 5. Mounting Dimensions (For reference only. mm/[in])**

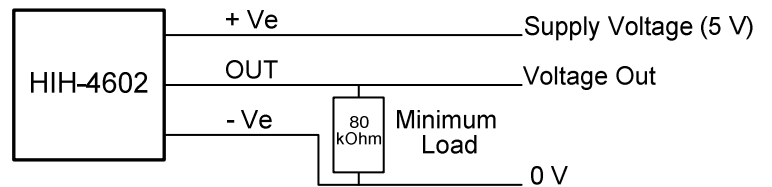


**Figure 6. RH Sensor Construction**

Sensor construction consists of a planar capacitor with a second polymer layer to protect against most dirt/dust particles, oils and other hazards.



**Figure 7. Typical Application Circuit**



## Order Guide

Catalog Listing	Description
HIH-4602-L	Relative humidity sensor in TO-5 can
HIH-4602-LP	Relative humidity sensor in TO-5 can with calibration and data printout

### ADDITIONAL HUMIDITY SENSOR INFORMATION

See the following associated literature at [www.honeywell.com/sensing](http://www.honeywell.com/sensing):

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

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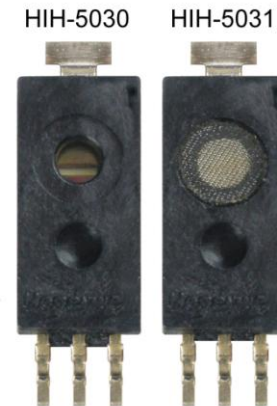
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# Honeywell

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December 2008  
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## HIH-5030/5031 Series

### Low Voltage Humidity Sensors



#### DESCRIPTION

The HIH-5030/5031 Series Low Voltage Humidity Sensors operate down to 2.7 Vdc, often ideal in battery-powered systems where the supply is a nominal 3 Vdc.

The HIH 5030/5031 complements our existing line of 5 Vdc SMD (Surface Mount Device) humidity sensors. SMD packaging on tape and reel allows for use in high volume, automated pick and place manufacturing, eliminating lead misalignment to printed circuit board through-holes.

The HIH-5030/5031 Series Humidity Sensors are designed specifically for high volume OEM (Original Equipment Manufacturer) users.

Direct input to a controller or other device is made possible by this sensor's near linear voltage output. With a typical current draw of only 200  $\mu$ A, the HIH-5030/5031 Series is ideally suited for many low drain, battery operated systems.

Tight sensor interchangeability reduces or eliminates OEM production calibration costs.

#### FEATURES

- Operates down to 2.7 Vdc, often ideal in battery-powered systems where the supply is a nominal 3 Vdc.
- Tape and reel packaging allows for use in high volume pick and place manufacturing (1,000 units per tape and reel)
- Molded thermoset plastic housing
- Near linear voltage output vs %RH
- Laser trimmed interchangeability
- Low power design
- Enhanced accuracy
- Fast response time
- Stable, low drift performance
- Chemically resistant

The HIH-5030/5031 Series delivers instrumentation-quality RH (Relative Humidity) sensing performance in a competitively priced, solderable SMD.

The HIH-5030 is a covered integrated circuit humidity sensor. The HIH-5031 is a covered, condensation-resistant, integrated circuit humidity sensor that is factory-fitted with a hydrophobic filter allowing it to be used in many condensing environments including industrial, medical and commercial applications.

The RH sensor uses a laser trimmed, thermoset polymer capacitive sensing element with on-chip integrated signal conditioning.

The sensing element's multilayer construction provides excellent resistance to most application hazards such as condensation, dust, dirt, oils and common environmental chemicals.

Sample packs are available. See order guide.

#### POTENTIAL APPLICATIONS

##### Industrial

- Air compressors
- Battery-powered systems
- Drying equipment
- HVAC (includes air conditioning, air movement, thermostats, humidifiers, de-humidifiers, humidistats, enthalpy sensing)
- OEM assemblies
- Office automation equipment
- Process equipment
- Refrigeration (includes bulk and transport systems)
- Telecommunications cabinets
- Weather stations and meteorology equipment

##### Medical

- Hospital air compressors
- Infant incubators
- Microenvironments
- Sleep apnea equipment
- Treadmill stress monitoring equipment

# HIH-5030/5031 Series

**Table 1. Performance Specifications (At 3.3 Vdc supply and 25 °C [77 °F] unless otherwise noted.)**

Parameter	Minimum	Typical	Maximum	Unit	Specific Note
Interchangeability (first order curve) 0% RH to 10% RH, 90% RH to 100% RH	-7	–	7	% RH	–
11% RH to 89% RH	-3	–	3	% RH	–
Accuracy (best fit straight line) 11% RH to 89% RH	-3	–	+3	% RH	4
Hysteresis	–	2	–	% RH	–
Repeatability	–	±0.5	–	% RH	–
Settling time	–	–	70	ms	–
Response time (1/e in slow moving air)	–	5	–	s	–
Stability (at 50% RH in 5 years)	–	±1.2	–	% RH	1
Voltage supply	2.7	–	5.5	Vdc	2
Current supply	–	200	500	µA	–
Voltage output (1st order curve fit)	$V_{OUT}=(V_{SUPPLY})(0.00636(\text{sensor RH}) + 0.1515)$ , typical at 25 °C				
Temperature compensation	True RH = (Sensor RH)/(1.0546 – 0.00216T), T in °C				
Output voltage temp. coefficient at 50% RH, 3.3 V	–	-2	–	mV/°C	–
Operating temperature	-40[-40]	See Figure 2.	85[185]	°C[°F]	–
Operating humidity (HIH-5030)	0	See Figure 2.	100	% RH	3
Operating humidity (HIH-5031)	0	See Figure 2.	100	% RH	–
Storage temperature	-50[-58]	–	125[257]	°C [°F]	–
Storage humidity	See Figure 3.			% RH	3

**Specific Notes:**

1. Includes stress outside of recommended operating zone.
2. Device is tested at 3.3 Vdc and 25 °C.
3. Non-condensing environment. When liquid water falls on the humidity sensor die, output goes to a low rail condition indicating no humidity.
4. Total accuracy including interchangeability is ±3 %RH.

**General Notes:**

- Sensor is ratiometric to supply voltage.
- Extended exposure to ≥90 % RH causes a reversible shift of 3 % RH.
- Sensor is light sensitive. For best performance, shield sensor from bright light.





# Low Voltage Humidity Sensors

Figure 1. Operating Environment (Non-condensing environment for HIH-5030 catalog listings only.)

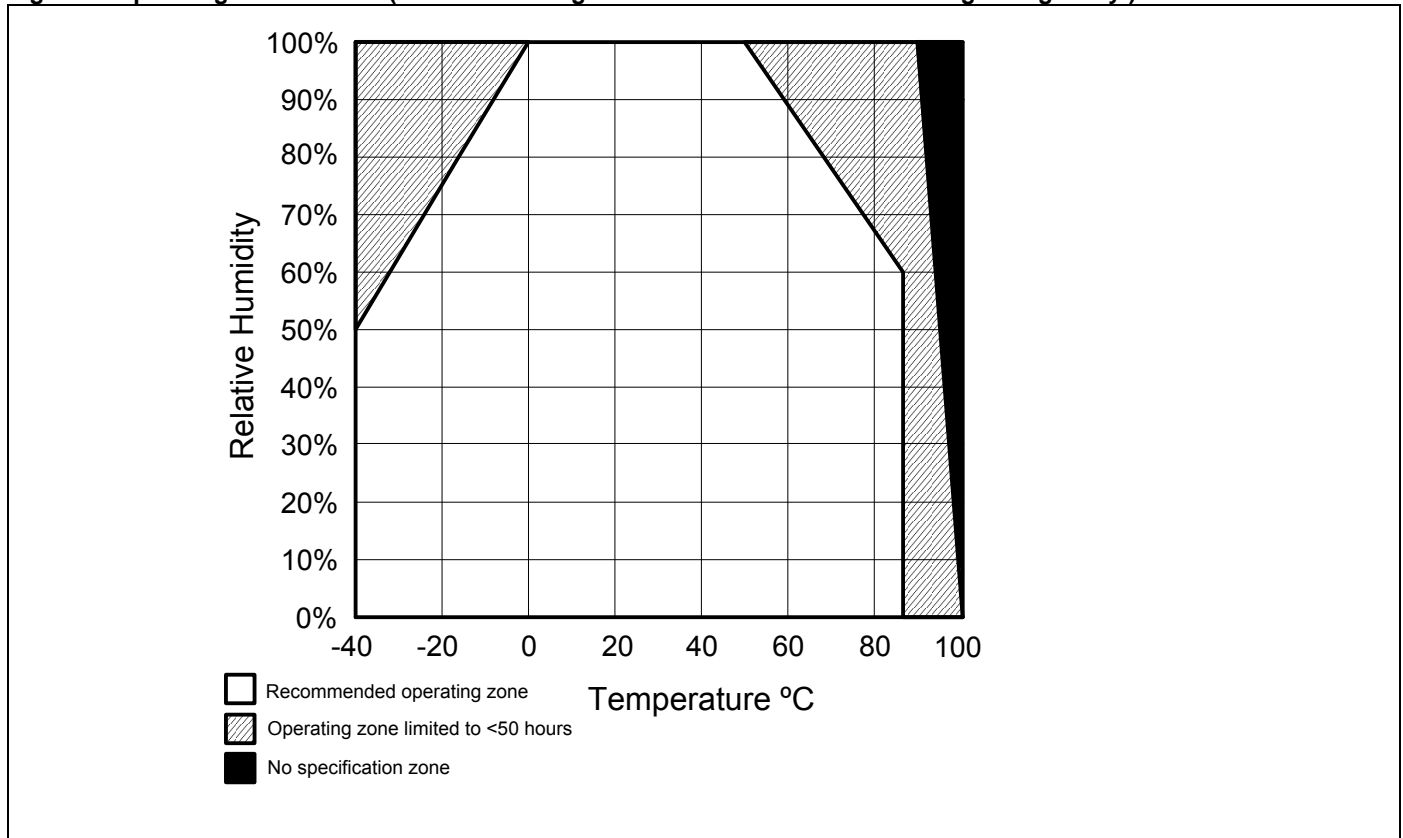
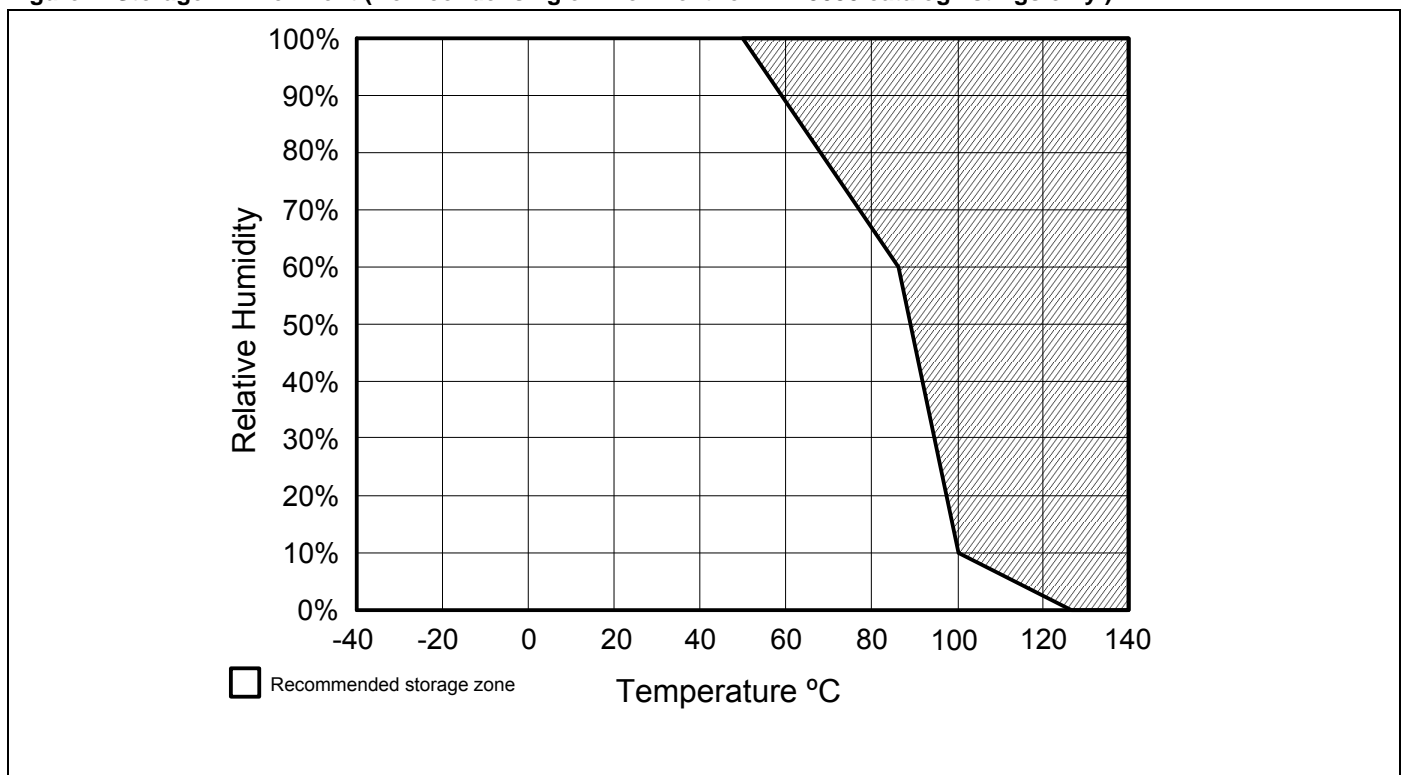


Figure 2. Storage Environment (Non-condensing environment for HIH-5030 catalog listings only.)



# HIH-5030/5031 Series

Figure 3. Typical Output Voltage vs Relative Humidity (At 25 °C and 3.3 Vdc.)

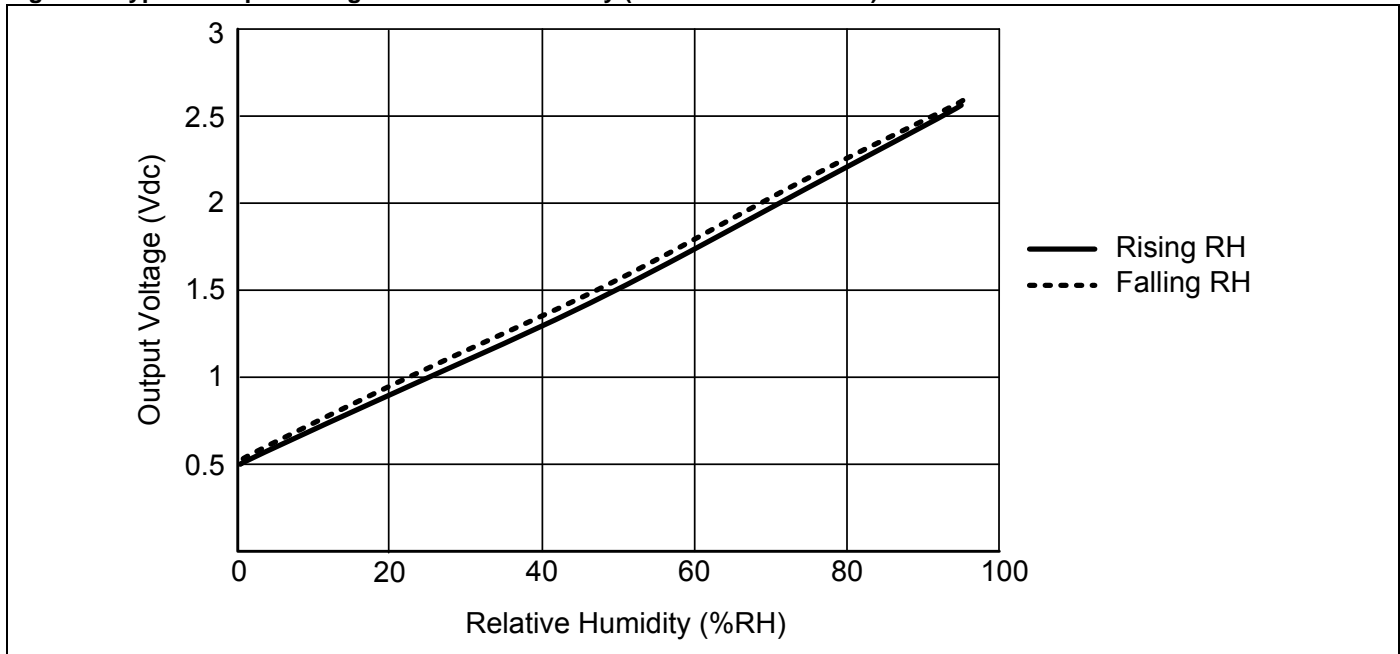
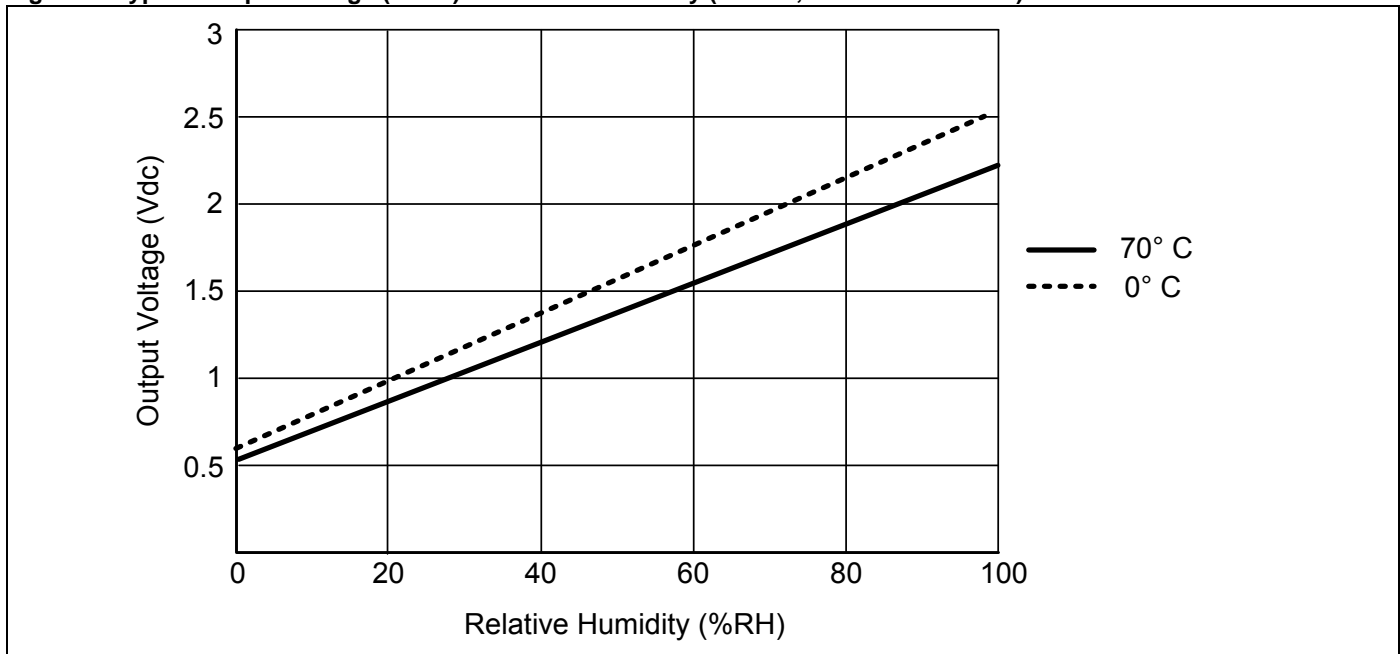


Figure 4. Typical Output Voltage (BFSL) vs Relative Humidity (At 0 °C, 70 °C and 3.3 Vdc.)



# Low Voltage Humidity Sensors

Figure 5. HIH-5030 Mounting Dimensions (For reference only. mm/[in])

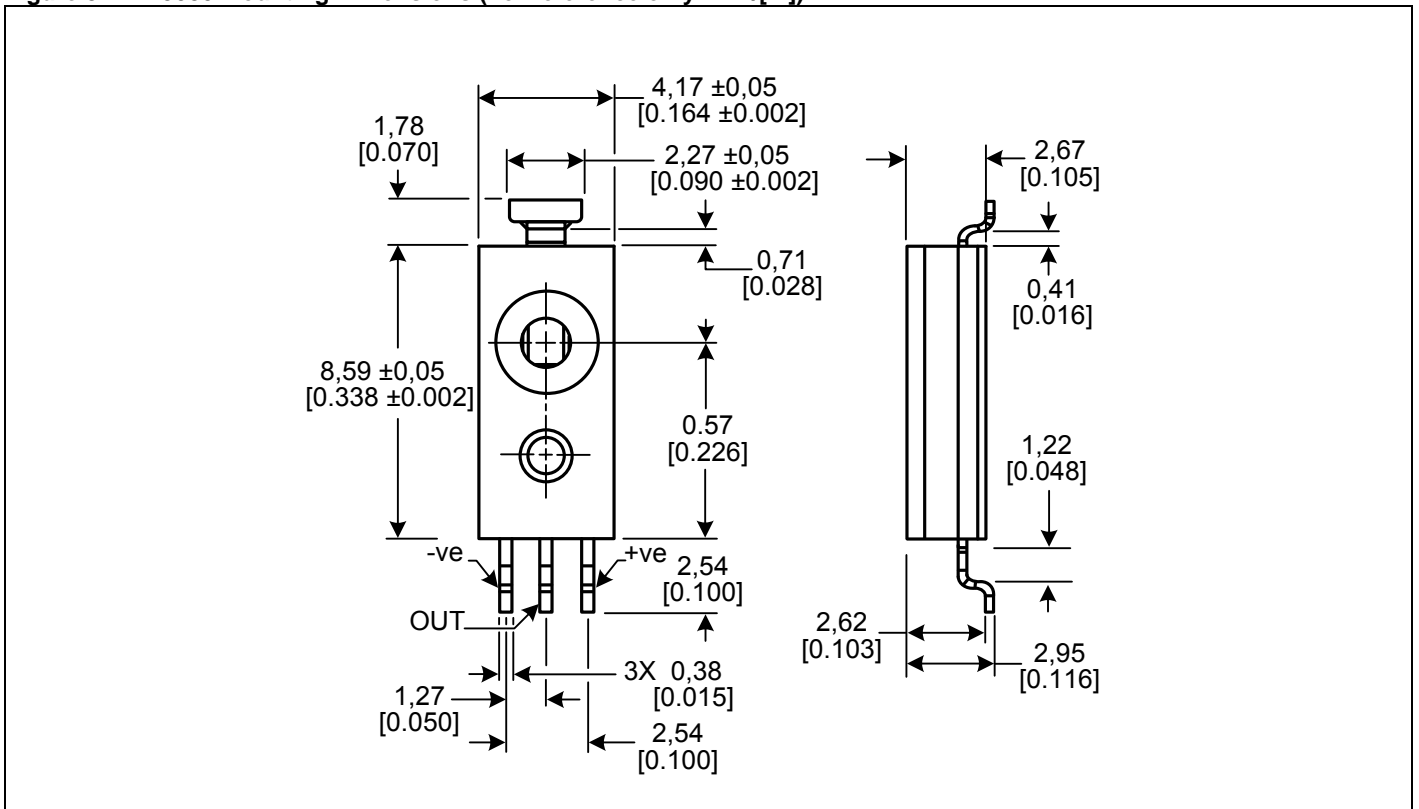
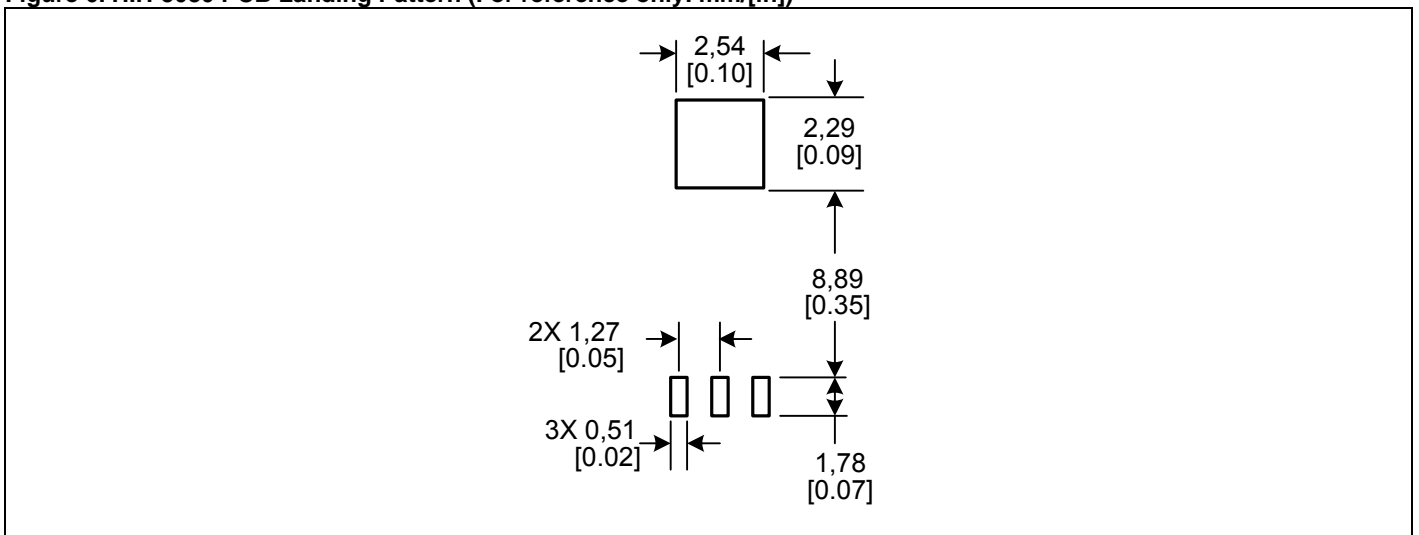


Figure 6. HIH-5030 PCB Landing Pattern (For reference only. mm/[in])



# HIH-5030/5031 Series

Figure 7. HIH-5031 Mounting Dimensions (For reference only. mm/[in])

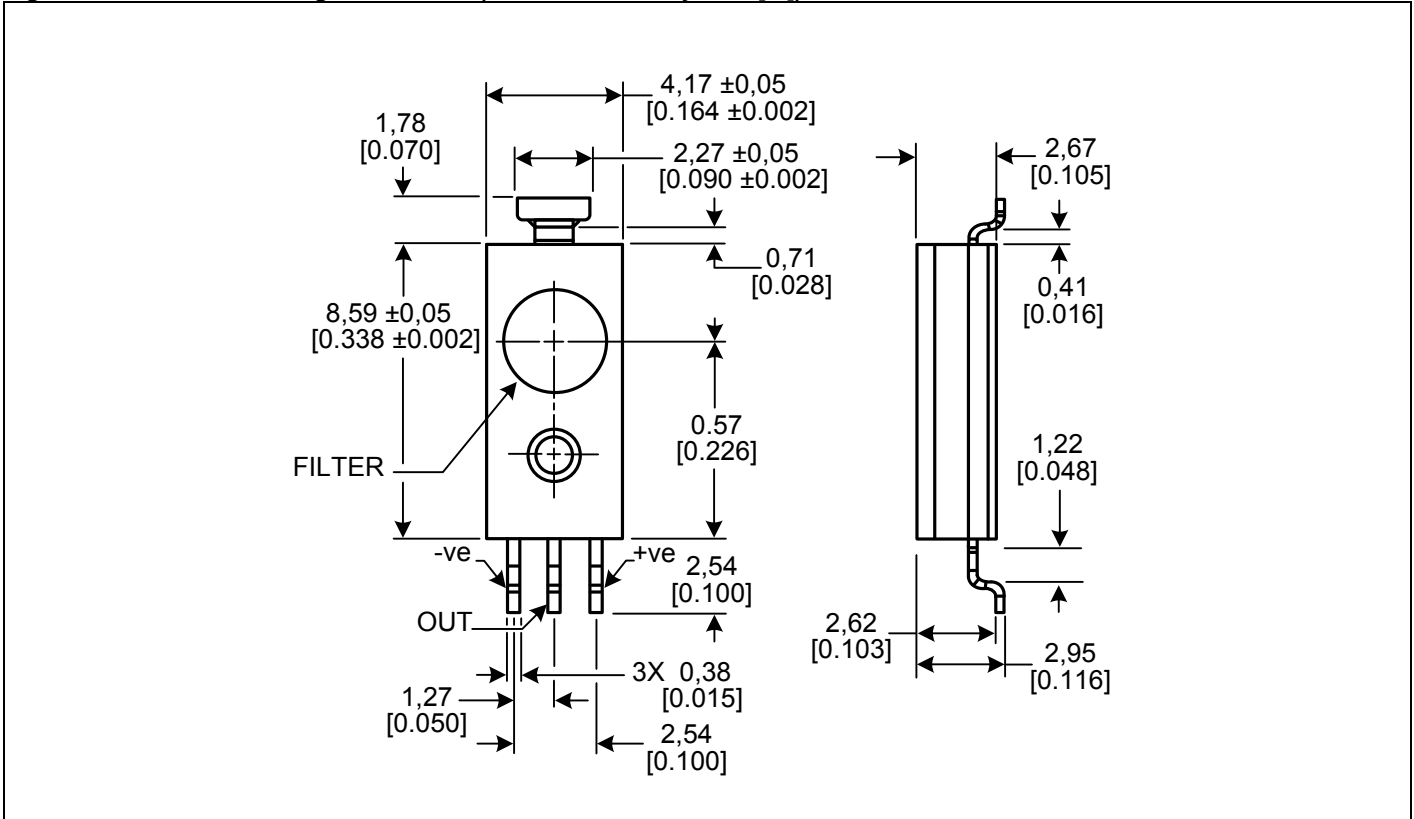
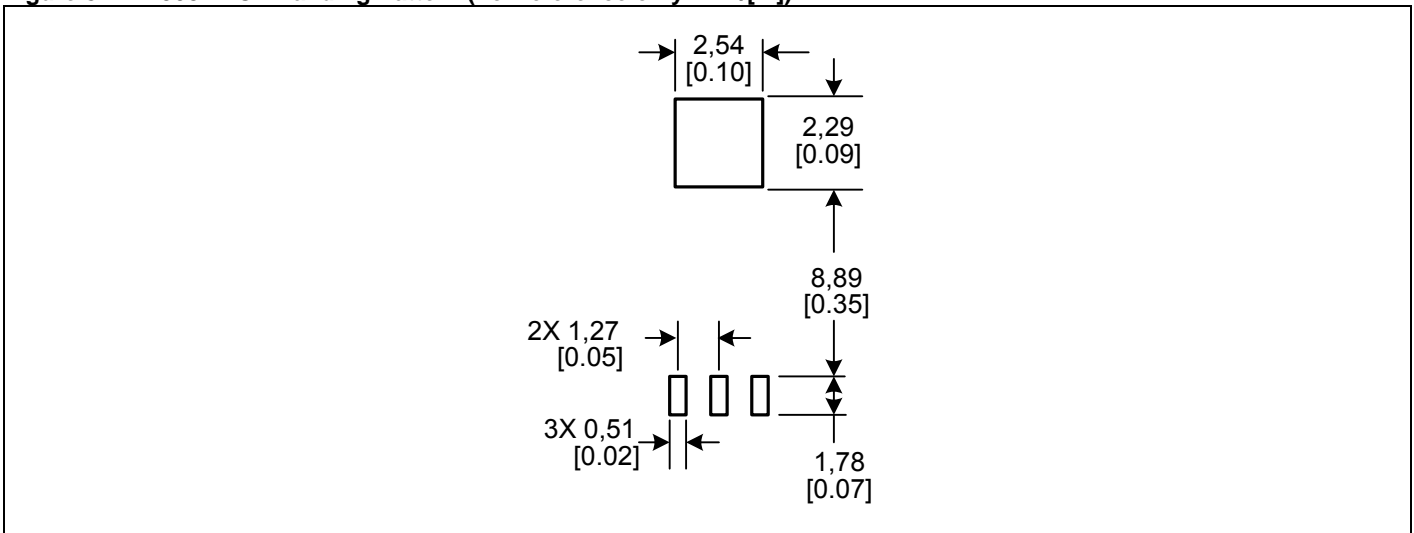
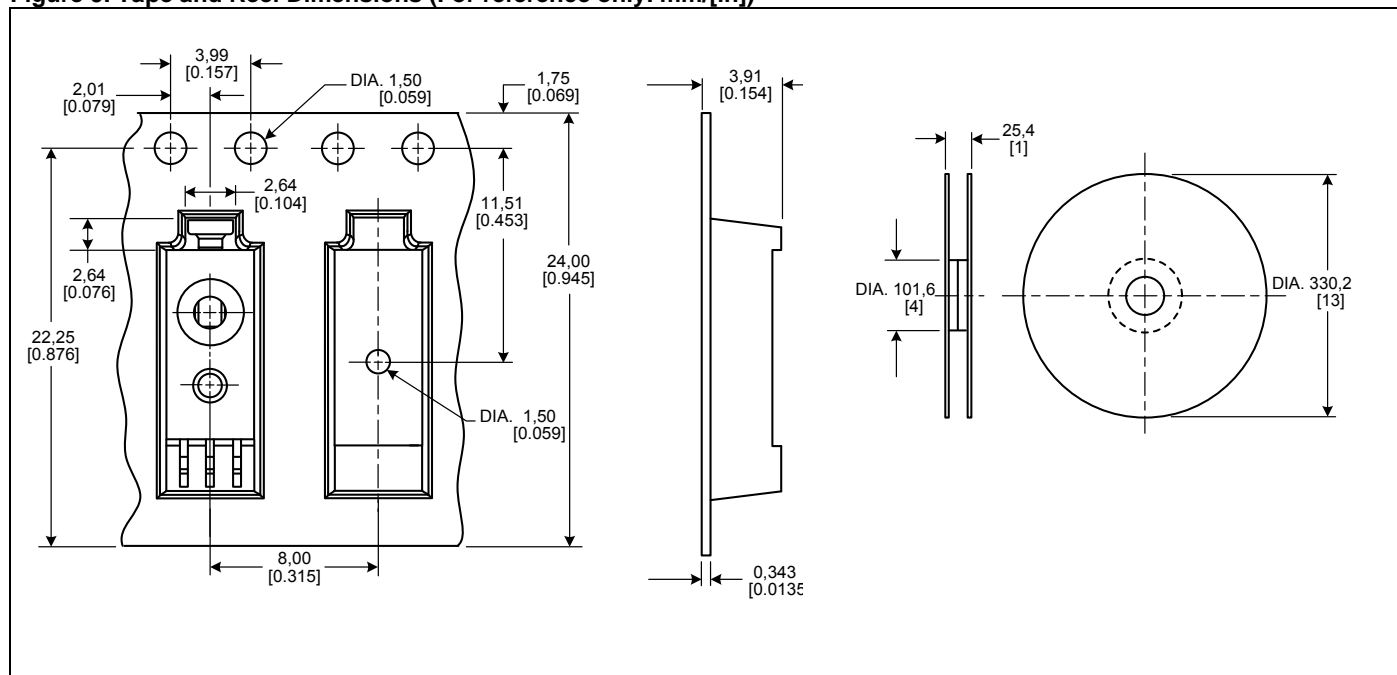


Figure 8. HIH-5031 PCB Landing Pattern (For reference only. mm/[in])

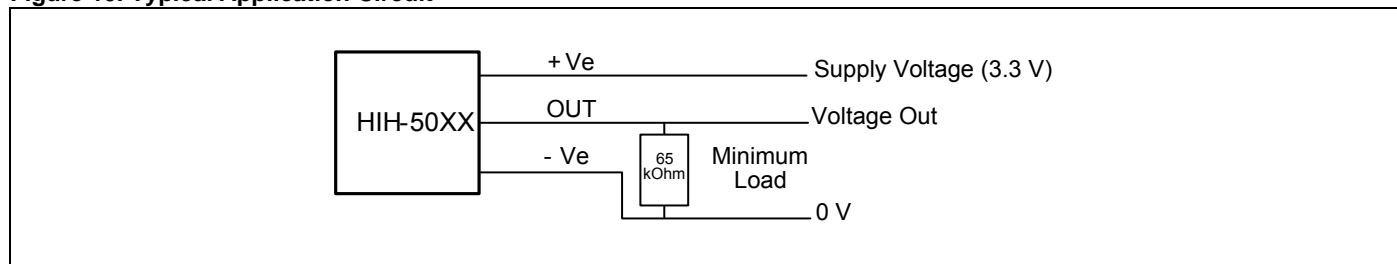


# Low Voltage Humidity Sensors

**Figure 9. Tape and Reel Dimensions (For reference only. mm/[in])**



**Figure 10. Typical Application Circuit**



**ORDER GUIDE**

Catalog Listing	Description
HIH-5030-001	Covered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-5031-001	Covered, filtered integrated circuit humidity sensor, SMD, 1000 units on tape and reel
HIH-5030-001S	Sample pack: covered integrated circuit humidity sensor, SMD, five units on tape
HIH-5031-001S	Sample pack: covered, filtered integrated circuit humidity sensor, SMD, sample pack, five units on tape

**ADDITIONAL HUMIDITY SENSOR INFORMATION**

See the following associated literature is available on the [Web](#):

- Product installation instructions
- Application sheets:
  - Humidity Sensor Performance Characteristics
  - Humidity Sensor Theory and Behavior
  - Humidity Sensor Moisture and Psychrometrics
  - Thermoset Polymer-based Capacitive Sensors

# HIH-5030/5031 Series

# Low Voltage Humidity Sensors

## WARNING

### MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
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