

# HC109

## Humidity / Temperature Sensor

The HC109 is designed to meet the needs of mass production automated assembly lines at a competitive price. The HC109 humidity sensors are positioned on the PCB at the same time as other SMD components and soldered using the reflow soldering method. The HC109 humidity sensor exhibits high reproducibility of sensor data and excellent linearity over the entire humidity range. The temperature dependence is also highly reproducible and allows software temperature compensation. This means a high accuracy over a wide temperature range, which is important e.g., for the calculation of the dew point temperature.



### Typical Applications

**Automotive**  
**Home appliances**  
**Industrial applications**

### Features

**SMD mounting**  
**High reproducibility**  
**Very good long term stability**  
**Small-size construction**

### Technical Data

Nominal capacitance $C_0$ (at 30 °C / 86 °F)	80 ± 12 pF
Response time $t_{63}$	< 6 s
Sensitivity (for $C_0 = 80$ pF, in average)	0.27 pF/%RH <sup>1)</sup>
Temperature dependency	$dC = -0.00095 \cdot RH \cdot (T - 30 \text{ °C})$ [pF]
Working range	Humidity: 0...100 %RH Temperature: -40...120 °C (-40...248 °F)
Linearity error (0...98 %RH)	< ±1.5 %RH
Hysteresis	1.7 ± 0.15 %RH
Long term stability at 20-30 °C (68-86 °F) / 20-80 %RH	Drift < 0.5 %/year <sup>2)</sup>
Loss tangent, typ.	< 0.05 typical
Maximum supply voltage (no DC voltage)	5 V ( $V_{PP}$ )
Maximum DC voltage	< 5 mV
Operating frequency	10...100 kHz, recommended 20 kHz

1) More details see "Characteristics" section

2) In environments with high concentrations of volatile organic compounds, the value may be higher.

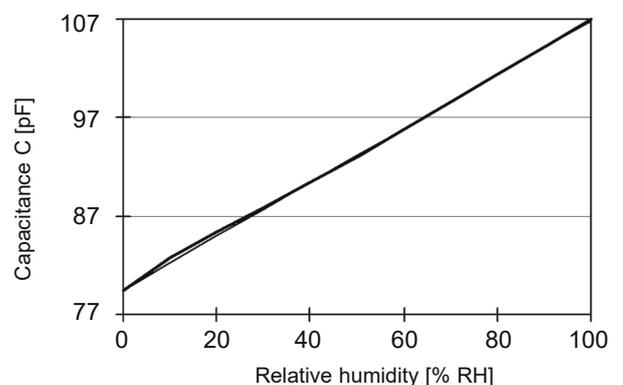
### Characteristics

The average increase of capacitance over the working range is 27.5 pF (HC109). For the range of 0...98% RH linear approximation is possible, errors will be lower than < ±1.5 %RH.

The sensor characteristic is determined by the following linear formula:

$$C(RH) = C_0 \cdot [1 + HC_0 \cdot RH]$$

with  $HC_0 = 3420 \pm 191$  ppm/%RH  
 $HC_0$  ... Humidity Coefficient



For high accuracy requirements, the sensitivity is determined by the following polynomial:

$$C(RH) = C_0 * [1 + HC_0 * RH + K(RH)]$$

whereby:

$$K(RH) = A_1 * RH + A_2 * RH^{1.5} + A_3 * RH^2 + A_4 * RH^{2.5}$$

$$A_1 = 2.6657 * 10^{-3}$$

$$A_2 = -9.6134 * 10^{-4}$$

$$A_3 = 1.1272 * 10^{-4}$$

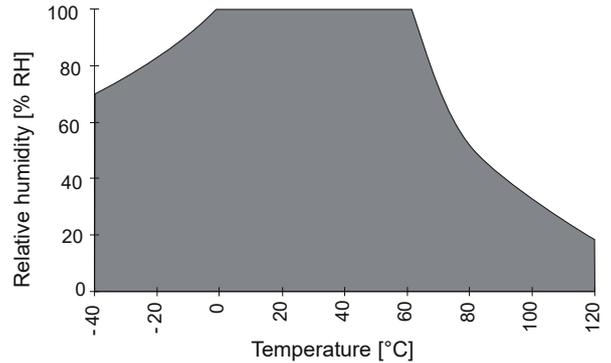
$$A_4 = -4.3 * 10^{-6}$$

## Working Range

The working range of the humidity sensors HC109 is shown with regard to the humidity/temperature limits.

Although the sensors would not fail beyond the limits, the specification is guaranteed only within the working range.

In applications with high humidity at high temperatures the time factor shall be considered.



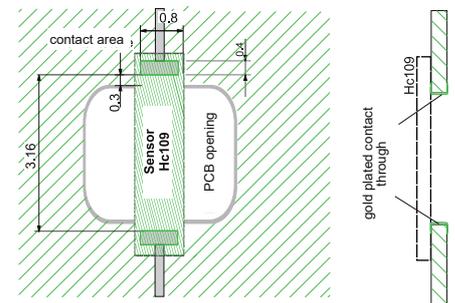
## Dimensions (mm)

1 mm = 0.03937" / 1" = 25.4 mm

### HC109



## Mounting Instructions



To allow full access of the air, the humidity sensor should be positioned over an opening in the printed circuit board (PCB).

False readings because of humidity assimilation at the front side of the PCB should be avoided as much as possible by using gold-plated-through holes.

## Assembling and Soldering

HC109 sensor series are designed for SMD automatic assembling with subsequent reflow-soldering.

### Recommended SMD equipment:

- Automatic tooling machine with suction pipette
- Optical control for sensor identification

## Ordering Guide

TYPE		TAPE AND REEL PACKAGING	
HC109	HC109	1000 sensors per reel	TR1
		2000 sensors per reel	TR2,5

## Ordering Example

### HC109-TR1

Type: HC109  
 Packaging: 1000 sensors per reel