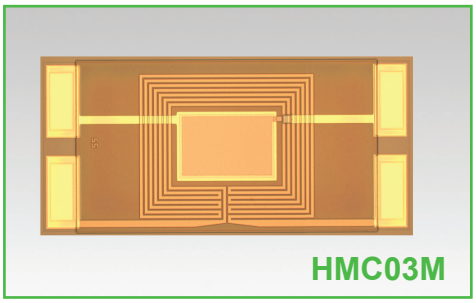
HMC03M

Heated Humidity Sensor for Radiosondes and Weather Balloons

HMC03M is optimized for short response time even at very low temperature (T) in the upper atmosphere. It combines on a silicon substrate a capacitive relative humidity (RH) sensor and a heating resistor (heater).
The heater is dedicated for fast recovery of the humidity sensor after condensation or icing. The construction with the heater positioned all around the RH sensor grants uniform temperature throughout the HMC03M structure, which leads to outstanding measuring performance in high-end weather observation.

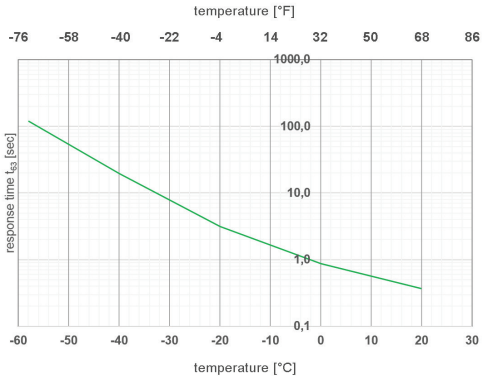

HMC03M

Features

Very short RH response time at low T
Fast recovery after condensation or icing due to sensor heating
High sensitivity

Technical Data

Humidity sensor

Nominal capacitance C_0 (at 30 °C / 86 °F)		120 ± 40 pF
Sensitivity (for C_0 = 120 pF, in average)		0.41 pF / % RH[1)]
Working range	humidity	0...100 % RH
	temperature	-80...60 °C (-112...140 °F)
Linearity error (0...98 % RH)		< ± 2 % RH
Hysteresis		1.9 ± 0.25 % RH
Response time RH t_{63}		

Temperature dependence[2)]	dC = -0.0014*RH*(T-30 °C) [pF]
Loss tangent	< 0.05
Supply voltage	5 V max (UPP)
DC voltage	< 5 mV
Operating frequency	10...100 kHz, recommended 20 kHz

Heater (Molybdenum)

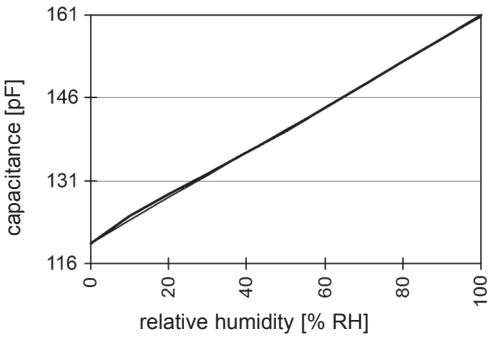
Nominal resistance R_0	100 ± 20 Ohm
Temperature coefficient	3500 ± 150 ppm/K
Self heating coefficient (SHC), typical (at 980 hPa)	
5 m/s	0.09 K/mW
1 m/s	0.17 K/mW
0.1 m/s	0.31 K/mW
Max. power	100 mW

1) More details see „Characteristics
2) Basic formula. Details for t < -20 °C on request

Characteristics

Humidity sensor

$C(RH) = C_0 * [1 + HC_0 * RH]$, where HC_0 = 3420 ± 250 ppm / % RH



Alternatively, a polynomial approximation of the characteristic can be used for high accuracy requirements:

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

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

$A_1 = 2.6657e^{-3}$ $A_2 = -9.6134e^{-4}$

$A_3 = 1.1272e^{-4}$ $A_4 = -4.3e^{-6}$

Heater

$R(t) = R_0 * \{1 + \alpha * t * [1 + (\beta + \gamma * t^2) * (\frac{t}{100} - 1)]\}$, where

α = 0.0031±0.00015 β = 0.0086 $\gamma = -5.6e^{-7}$ for t < 0 °C (32 °F) $\gamma = 0$ for t ≥ 0 °C (32 °F)

Alternative formula according IEC60751:

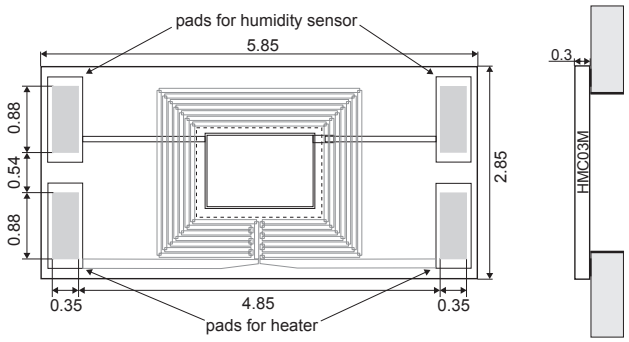
$R(t) = R_0 * (1 + A * t + B * t^2 + C * (t - 100) * t^3)$, where

$A = \alpha * (1 - \beta)$ $B = \frac{\alpha * \beta}{100}$ $C = \frac{\alpha * \gamma}{100}$

Example for TK = 3100 ppm/°C

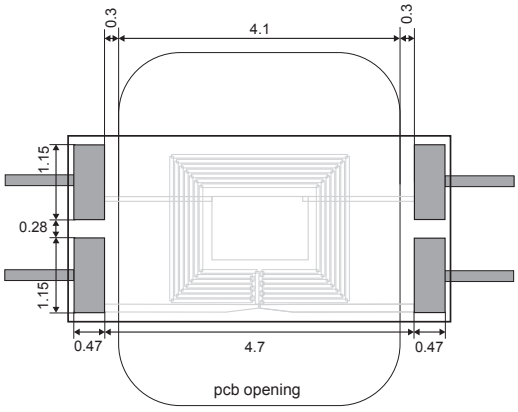
A = 0.0030733 $B = 2.666e^{-7}$ $C = -1.736e^{-11}$ for t < 0 °C (32 °F) C = 0 for t ≥ 0 °C (32 °F)

Dimensions (mm)



1 mm = 0.03937”
1” = 25.4 mm

Mounting Instructions



For shortest response time, in case of mounting onto a printed circuit board (PCB), HMC03M shall be positioned over an opening to allow enough air circulation around the sensor.
For best accuracy it is important to avoid moisture accumulation such as at the edge of the PCB by selecting appropriate board material or gold-plating the edge of the opening.

Assembling and Soldering

HMC03M is an SMD (surface mounted device) sensor, appropriate for automatic assembling with subsequent reflow soldering. Please refer to the handling guidelines at www.epluse.com.

Ordering Guide

TYPE	PACKAGING (tape and reel)	
HMC03M	500 sensors	(TR0,5)
	1000 sensors	(TR1)
	2500 sensors	(TR2,5)

Order Example

HMC03MTR1

Type: HMC03M
Packaging: 1000 sensors per reel