Humidity sensors

Experts in environmental sensing

SENSIRION

Sensirion – the market leader through innovation

Sensirion's humidity and temperature sensors have established themselves as the market standard due to their best-in-class performance, high reliability, technology and price leadership. The SHT1x was the first digital, calibrated, reflow solderable humidity sensor (launched in 2001), marking the beginning of a new category of humidity sensors. Sensirion's latest product innovations have set the market standard and opened up a wide range of new applications. Sensirion's humidity and temperature and temperature-only products are based on Sensirion's CMOSens® Technology, which combines the strengths of standard CMOS production processes and advanced MEMS technology on a single silicon chip. The temperature sensors are based on a silicon bandgap temperature sensor principle, while humidity is sensed using a capacitor. Its dielectric is realized via a polymer, which absorbs or desorbs water depending on the ambient humidity. The capacitive element is designed as an interdigitated structure of electrodes.

Main use drivers for SHTxx

Health & comfort

Humidity and temperature significantly affect personal health and comfort. Optimizing humidity and temperature in your environment can improve personal well-being. Applications include humidifiers, baby monitors and home care respiratory equipment.

Quality & reliability

The quality and reliability of various processes are strongly determined by relative humidity and temperature. Measuring these parameters allows improvement in the quality and reliability of such processes. Applications include the logistics of perishable goods, humidity sensing in printers and water intrusion detection in critical electronic devices.

Energy saving

Measurement of humidity and temperature can help optimize processes and thus save energy and costs. Applications include automotive engine control, smart condensation control for refrigerators and the optimization of A/C cooling cycles.

Safety

Humidity and temperature may influence the safety of a system, a process or a person. Humidity and temperature measurement can thus help to ensure their safety. Applications include automotive wind-shield anti-fogging, water intrusion detection in battery packs and building supervision for insurance purposes.

Tested and proven worldwide

Our in-house sensor calibration and testing infrastructure enables effective procedures that comply with established quality standards. Each sensor is individually calibrated and tested for quality and accuracy. The high reliability of our sensors has been proven by more than half a billion sensors in the field over more than ten years. Additionally, the reliability is demonstrated by qualification based on the AEC-Q100 automotive standard.

Facts about SHTxx

Digital humidity sensing

By pioneering the digital, calibrated, reflow solderable humidity sensor in 2001, Sensirion marked the beginning of a new category of humidity sensors.

Humidity sensor technology

SHTxx sensors are polymer-based, capacitive humidity sensors. The capacitor is realized with an interdigitated structure of electrodes.

Temperature sensor technology

SHTxx sensors contain a bipolar junction transistor-based silicon bandgap temperature sensor.

Designed for mass production

SHTxx sensors are digital, calibrated and reflow solderable. Delivered in T&R for standard SMT assembly. High volumes are available.

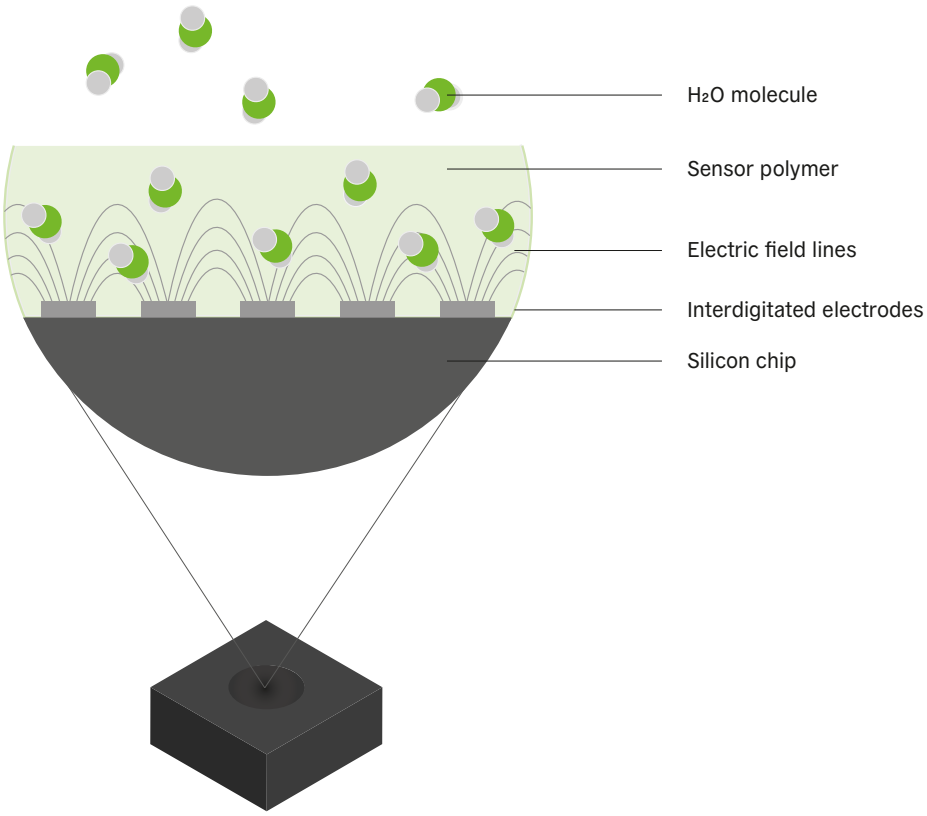


Fig: Interdigitated electrodes with polymer layer (cross section)

What we offer

Expert first points of contact

- Specialized and experienced sales force
- Worldwide presence with a global distribution network

Fast and easy product evaluation

- Comprehensive product portfolio
- Easy-to-use evaluation kits for effortless humidity and temperature measurement during sensor evaluation
- Technical documents – data sheets, sample codes, application notes

Design-in support

- Assistance in the integration of SHTxx sensors into your application
- Proven best practices to ensure that your production concept accommodates the requirements of SHTxx sensors

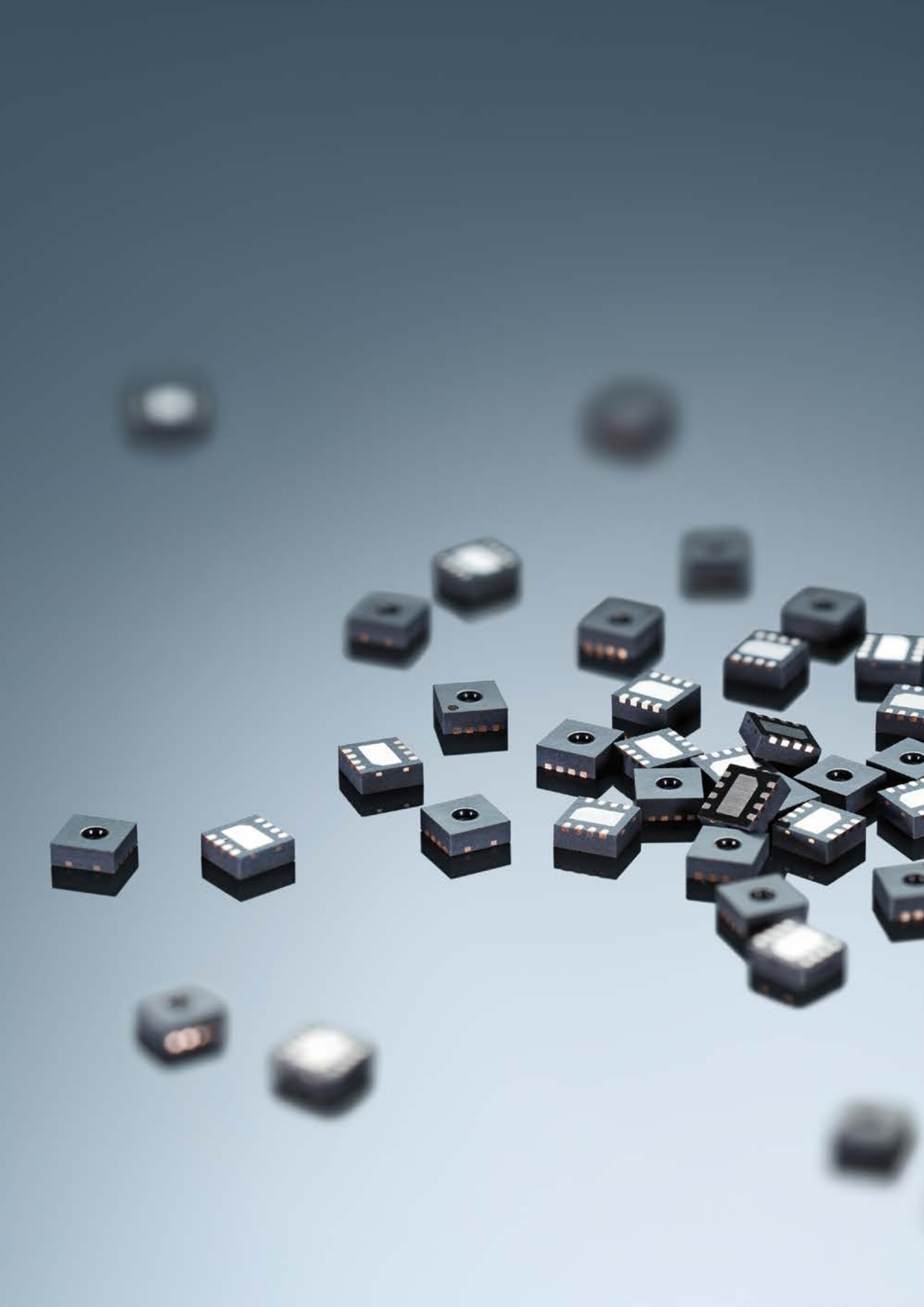
Lifetime support

- Reliable and flexible production
- Sustainable product innovation roadmap to meet your future needs

Sensirion evaluation kit for environmental sensors

Fast and easy evaluation for your sensor application

The evaluation kit SEK-Environmental Sensing is designed for a quick, easy and cost-efficient evaluation of Sensirion's environmental sensors. This facilitates the evaluation of sensors and the development of innovative sensor applications. The kit combines plug-and-play hardware with an easy-to-use viewer software for in-depth evaluation, the ControlCenter. Each evaluation kit includes a Sensirion SensorBridge, all required connector cables and various sensor samples. The SensorBridge features two independent I²C channels that allow simultaneous evaluation of two environmental sensor samples. The ControlCenter viewer software makes it possible to display and log the sensor signals for multiple sensors connected to several SensorBridges on the same PC.

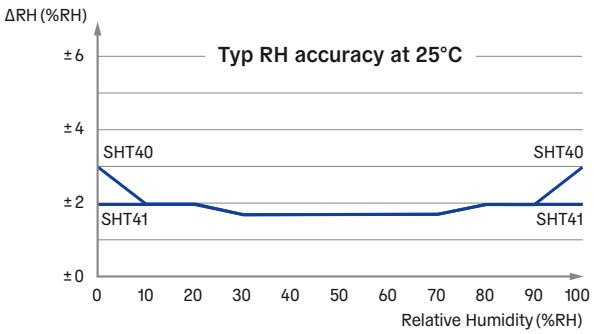


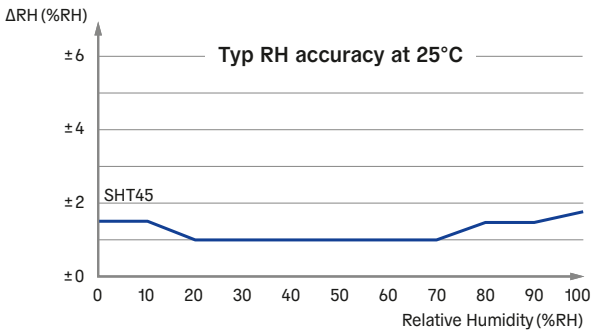
Humidity sensors

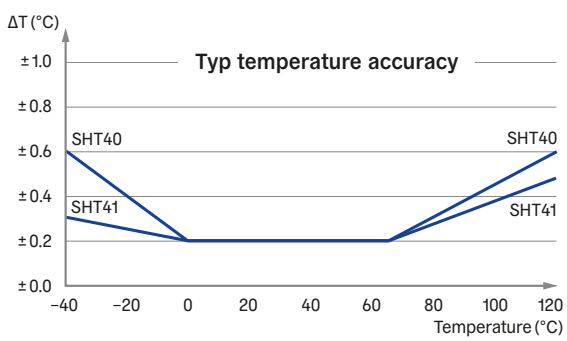
SHT4x – the new market standard

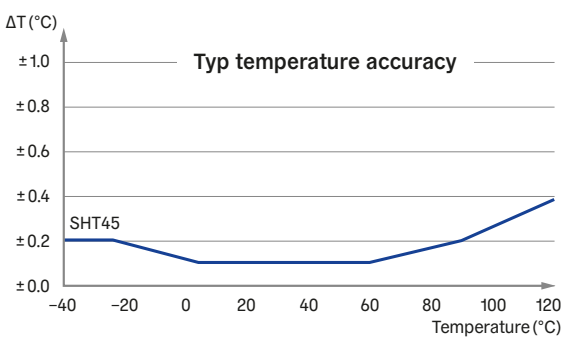
- Ultra-low power consumption
- Supply voltage range: 1.08–3.6 V
- Small 4-Pin DFN package: 1.5 × 1.5 × 0.5 mm³

Humidity sensor	SHT40	SHT41	SHT45
Typical accuracy (% RH)	± 1.8 (30 to 70% RH)	± 1.8 (30 to 70% RH)	± 1 (20 to 70% RH)
Maximum accuracy (% RH)	± 3.5 (30 to 70% RH)	± 2.5 (0 to 90% RH)	± 2 (0 to 90% RH)
Hysteresis (%RH)	± 0.8	± 0.8	± 0.8
Typ long-term drift (%RH/y)	< 0.25	< 0.25	< 0.25
Operating range (%RH)	0 to 100	0 to 100	0 to 100
Response time (s)	4	4	4
Temperature sensor			
Typical accuracy (°C)	± 0.2 (0 to 65 °C)	± 0.2 (0 to 65 °C)	± 0.1 (5 to 60 °C)
Maximum accuracy (°C)	± 0.4 (0 to 65 °C)	± 0.4 (0 to 65 °C)	± 0.2 (5 to 60 °C)
Typ long-term drift (°C/y)	< 0.03	< 0.03	< 0.03
Operating range (°C)	–40 to 125	–40 to 125	–40 to 125
Response time (s)[1]	2	2	2
Electrical			
Interface	I²C	I²C	I²C
Number of addresses available	4	4	4
Supply voltage range (V)	1.08 to 3.6	1.08 to 3.6	1.08 to 3.6
Measurement duration[2] (ms) (high/low)	6.9 (high), 1.3 (low)	6.9 (high), 1.3 (low)	6.9 (high), 1.3 (low)
Avg current consumption[3] (µA) (high/low)	2.4 (high), 0.4 (low)	2.4 (high), 0.4 (low)	2.4 (high), 0.4 (low)
Idle current (nA)	80	80	80
Integrated Heater			
Power (mW)	20 – 110 – 200	20 – 110 – 200	20 – 110 – 200
Pulse duration (s)	0.1 – 1	0.1 – 1	0.1 – 1
Other			
Protection option (Q4 2022)		Filter membrane, protective cover	





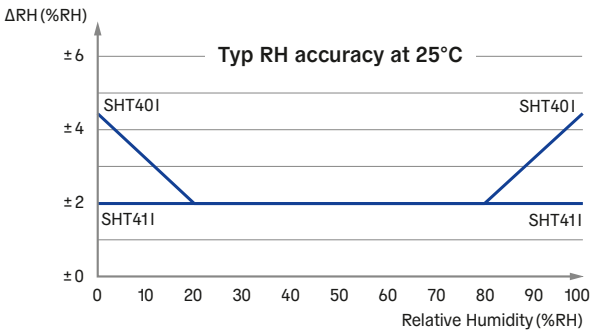


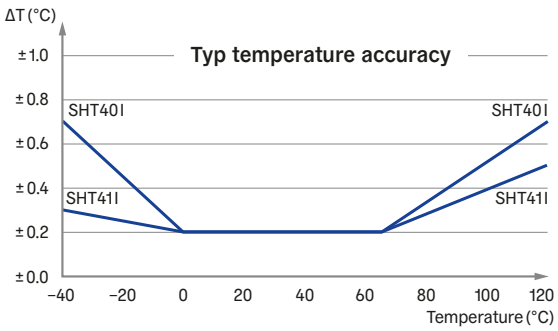


SHT4xI – the high reliability industrial solution

- Designed for industrial applications
- Highest reliability under rough conditions
- Robust housing and increased ESD protection

Humidity sensor	**SHT40I-Digital**	**SHT41I-Digital**
Typical accuracy (% RH)	± 2 (20 to 80% RH)	± 2 (0 to 100% RH)
Maximum accuracy (% RH)	± 4 (20 to 80% RH)	± 2.5 (0 to 90% RH)
Hysteresis (%RH)	± 0.8	± 0.8
Typ long-term drift (%RH/y)	< 0.25	< 0.25
Operating range (%RH)	0 to 100	0 to 100
Response time (s)	4	4
Temperature sensor		
Typical accuracy (°C)	± 0.2 (0 to 65 °C)	± 0.2 (0 to 65 °C)
Maximum accuracy (°C)	± 0.4 (0 to 65 °C)	± 0.4 (0 to 65 °C)
Typ long-term drift (°C/y)	< 0.03	< 0.03
Operating range (°C)	–40 to 125	–40 to 125
Response time (s)[1]	2	2
Electrical		
Interface	I²C	I²C
Number of addresses available	4	4
Supply voltage range (V)	2.3 to 5.5	2.3 to 5.5
Measurement duration[2] (ms) (high/low)	6.9 (high), 1.3 (low)	6.9 (high), 1.3 (low)
Avg current consumption[3] (µA) (high/low)	21 (high), 18 (low)	21 (high), 18 (low)
Idle current (µA)	18	18
Integrated Heater		
Power (mW)	20 – 110 – 200	20 – 110 – 200
Pulse duration (s)	0.1 – 1	0.1 – 1
Other		
Protection option (Q4 2022)	Filter membrane, protective cover	





Please note that above values are of indicatory nature only. For detailed information please consult the respective datasheet.

[1] Temperature response times very much depend on thermal conductivity of substrate material of the sensor.

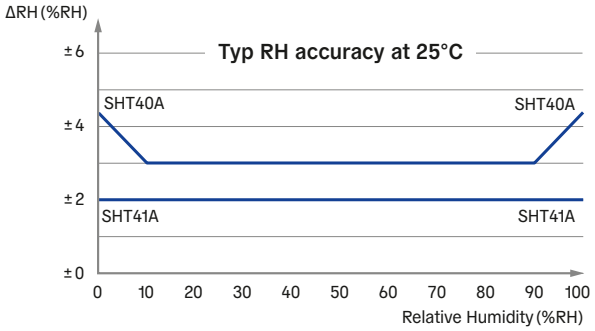
[2] Combined RH&T measurement. Different measurement modes possible (differing either in resolution or repeatability).

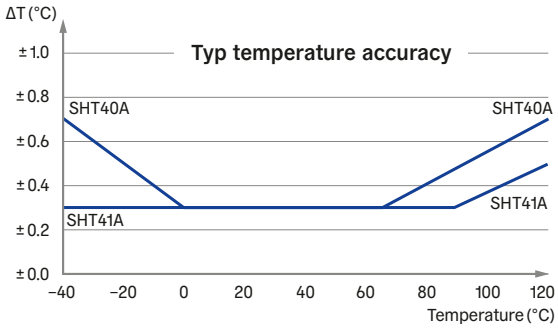
[3] "High" indicates a measurement with the highest precision/power mode (highest resolution, best repeatability), "low" indicates a measurement with the lowest precision/power mode (lowest resolution, least repeatability).

SHT4xA – the global automotive market leader

- Designed for automotive applications
- Wettable flanks packaging available
- AEC Q100 qualification

Humidity sensor	**SHT40A**	**SHT41A**
Typical accuracy (% RH)	± 3 (10 to 90% RH)	± 2 (0 to 100% RH)
Maximum accuracy (% RH)	± 4.5 (10 to 90% RH)	± 2.5 (0 to 90% RH)
Hysteresis (%RH)	±0.8	± 0.8
Typ long-term drift (%RH/y)	< 0.25	< 0.25
Operating range (%RH)	0 to 100	0 to 100
Response time (s)	4	4
Temperature sensor		
Typical accuracy (°C)	± 0.3 (0 to 65 °C)	± 0.3 (–40 to 90 °C)
Maximum accuracy (°C)	± 0.4 (0 to 65 °C)	± 0.4 (–40 to 90 °C)
Typ long-term drift (°C/y)	< 0.03	< 0.03
Operating range (°C)	–40 to 125	–40 to 125
Response time (s)[1]	2	2
Electrical		
Interface	I²C, PWM, SDM, MSPPM	I²C, PWM, SDM, MSPPM
Number of addresses available	4 (I²C)	4 (I²C)
Supply voltage range (V)	2.3 to 5.5	2.3 to 5.5
Measurement duration[2] (ms) (high/low)	6.9 (high), 1.3 (low)	6.9 (high), 1.3 (low)
Avg current consumption3 (µA) (high/low) (I²C)	21 (high), 18 (low)	21 (high), 18 (low)
Avg current consumption (µA) (PWM)	50	50
Idle current (µA)	18	18
Integrated Heater		
Power (mW)	20 – 110 – 200	20 – 110 – 200
Pulse duration (s)	0.1 – 1	0.1 – 1
Other		
Wettable Flanks	Yes	Yes





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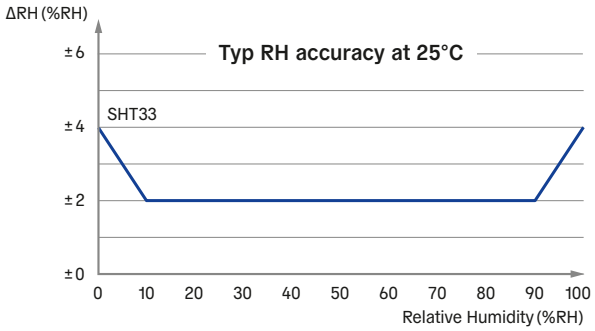
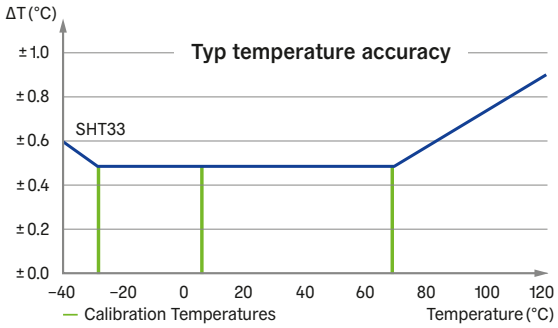
SHT33 – the digital sensor with ISO 17025 calibration

- ISO17025 certified
- Calibration set points: –30 °C, 5 °C and 70 °C
- Identification with unique chip serial number

Humidity sensor	**SHT33**
Typical accuracy (% RH)	± 2 (10 to 90% RH)
Maximum accuracy (% RH)	± 4.5 (10 to 90% RH)
Hysteresis (%RH)	± 0.8
Typ long-term drift (%RH/y)	< 0.25
Operating range (%RH)	0 to 100
Response time (s)	8
Temperature sensor	
Maximum accuracy (°C)	± 0.48 (–30 to 70 °C)
Typ long-term drift (°C/y)	< 0.01
Operating range (°C)	–40 to 125
Response time (s)[1]	2
Electrical	
Interface	I²C
Number of addresses available	2
Supply voltage range (V)	2.15 to 5.5
Measurement duration[2] (ms) (high/low)	12.5 (high), 2.5 (low)
Avg current consumption[3] (µA) (high/low)	7.7 (high), 1.7 (low)
Idle current (µA)	0.2
ISO17025 certificates	
Reel calibration certificate	Available online as .pdf and .csv
Individual component certificate	Available online as .pdf and .csv





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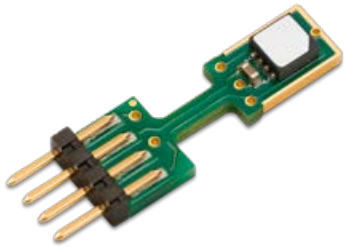
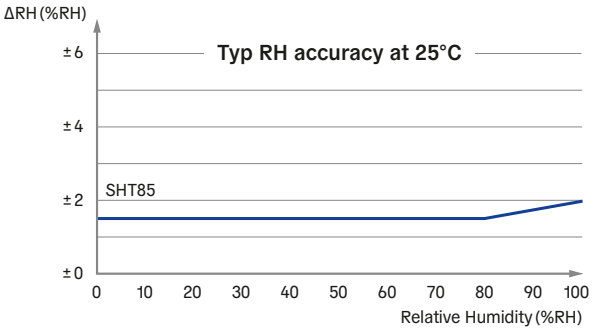
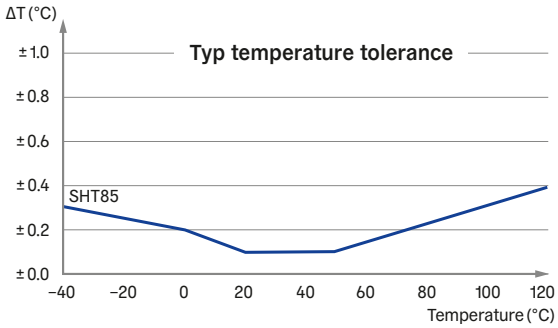


SHT85 – the high-end replaceable solution

- Suitable for manual assembly and replacement (plug and play)
- Wide supply voltage range up to 5 V
- Ultra-high accuracy

Humidity sensor	**SHT85**
Typical accuracy (% RH)	± 1.5 (0 to 80% RH)
Maximum accuracy (% RH)	± 1.8 (0 to 80% RH)
Hysteresis (%RH)	± 0.8
Typ long-term drift (%RH/y)	< 0.25
Operating range (%RH)	0 to 100
Response time (s)	8
Temperature sensor	
Typical accuracy (°C)	± 0.1 (20 to 50 °C)
Maximum accuracy (°C)	± 0.3 (20 to 50 °C)
Typ long-term drift (°C/y)	< 0.03
Operating range (°C)	–40 to 125
Response time (s)[1]	2
Electrical	
Interface	I²C
Number of addresses available	1
Supply voltage range (V)	2.15 to 5.5
Measurement duration[2] (ms) (high/low)	12.5 (high), 2.5 (low)
Avg current consumption[3] (µA) (high/low)	7.7 (high), 1.7 (low)
Idle current (µA)	0.2
Other	
Protection option	Filter membrane included as standard





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Technology at heart,
future in mind.