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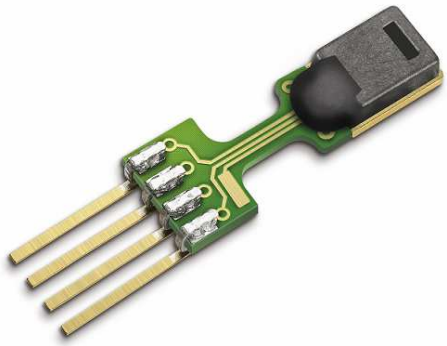
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SENSIRION
THE SENSOR COMPANY

Datasheet SHT7x (SHT71, SHT75)

Humidity and Temperature Sensor

- Fully calibrated
- Digital output
- Low power consumption
- Excellent long term stability
- Pin type package – easy integration



Product Summary

SHT7x (including SHT71 and SHT75) is Sensirion's family of relative humidity and temperature sensors with pins. The sensors integrate sensor elements plus signal processing in compact format and provide a fully calibrated digital output. A unique capacitive sensor element is used for measuring relative humidity while temperature is measured by a band-gap sensor. The applied CMOSens® technology guarantees excellent reliability and long term stability. Both sensors are seamlessly coupled to a 14bit analog to digital converter and a serial interface circuit. This results in superior signal quality, a fast response time and insensitivity to external disturbances (EMC).

Each SHT7x is individually calibrated in a precision humidity chamber. The calibration coefficients are programmed into an OTP memory on the chip. These coefficients are used to internally calibrate the signals from the sensors. The 2-wire serial interface and internal voltage regulation allows for easy and fast system integration. The small size and low power consumption makes SHT7x the ultimate choice for even the most demanding applications.

SHT7x is supplied on FR4 with pins which allows for easy integration or replacement. The same sensor is also available surface mountable packaging (SHT1x) or on flex print (SHTA1).

Dimensions

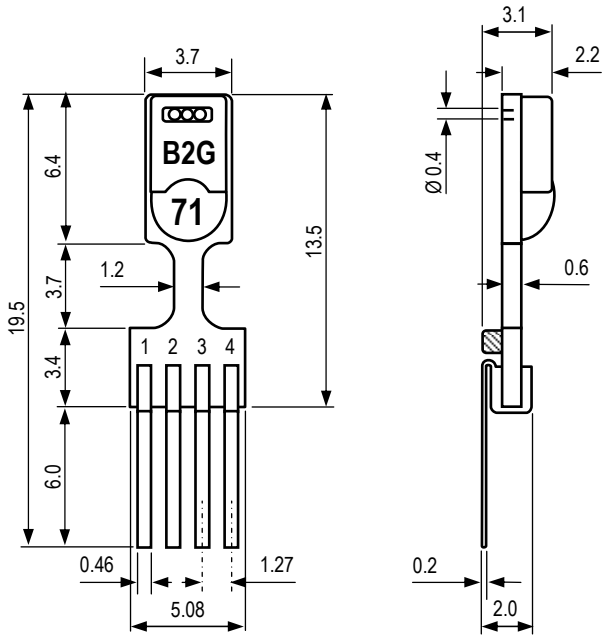


Figure 1: Drawing of SHT7x (applies to SHT71 and SHT75) sensor packaging, dimensions in mm (1mm = 0.039inch). Contact assignment: 1: SCK, 2: VDD, 3: GND, 4: DATA. Hatched item on backside of PCB is a 100nF capacitor – see Section 2.1 for more information.

Sensor Chip

SHT7x V4 – for which this datasheet applies – features a version 4 Silicon sensor chip. Besides a humidity and a temperature sensor the chip contains an amplifier, A/D converter, OTP memory and a digital interface. V4 sensors can be identified by the alpha-numeric traceability code on the sensor cap – see example "B2G" code on Figure 1.

Material Contents

While the sensor is made of a CMOS chip the sensor housing consists of an LCP cap with epoxy glob top on an FR4 substrate. Pins are made of a Cu/Be alloy coated with Ni and Au. The device is fully RoHS and WEEE compliant, thus it is free of Pb, Cd, Hg, Cr(6+), PBB and PBDE.

Evaluation Kits

For sensor trial measurements, for qualification of the sensor or even experimental application of the sensor there is an evaluation kit *EK-H2* available including sensor, hard and software to interface with a computer.

For more sophisticated and demanding measurements a multi port evaluation kit *EK-H3* is available which allows for parallel application of up to 20 sensors.

Sensor Performance

Relative Humidity

Parameter	Condition	min	typ	max	Units
Resolution[1]		0.5	0.03	0.03	%RH
		8	12	12	bit
Accuracy[2] SHT71	typ		±3.0		%RH
	max	see Figure 2			
Accuracy[2] SHT75	typ		±1.8		%RH
	max	see Figure 2			
Repeatability			±0.1		%RH
Replacement		fully interchangeable			
Hysteresis			±1		%RH
Nonlinearity	raw data		±3		%RH
	linearized		<<1		%RH
Response time[3]	tau 63%		8		s
Operating Range		0		100	%RH
Long term drift[4]	normal		< 0.5		%RH/yr

Temperature

Parameter	Condition	min	typ	max	Units
Resolution[1]		0.04	0.01	0.01	°C
		12	14	14	bit
Accuracy[2] SHT71	typ		±0.4		°C
	max	see Figure 3			
Accuracy[2] SHT75	typ		±0.3		°C
	max	see Figure 3			
Repeatability			±0.1		°C
Replacement		fully interchangeable			
Operating Range		-40		123.8	°C
		-40		254.9	°F
Response Time [6]	tau 63%	5		30	s
Long term drift			< 0.04		°C/yr

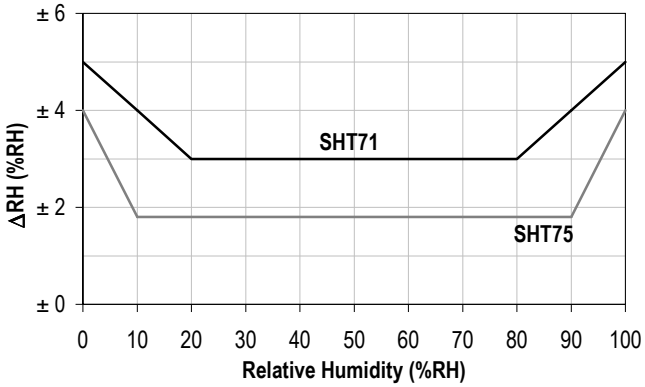


Figure 2: Maximal RH-tolerance at 25°C per sensor type.

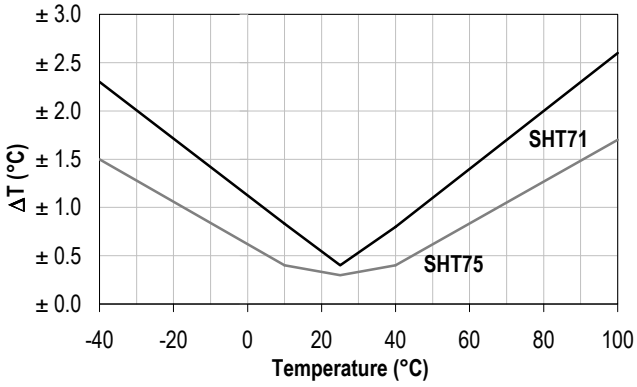


Figure 3: Maximal T-tolerance per sensor type.

Electrical and General Items

Parameter	Condition	min	typ	max	Units
Source Voltage		2.4	3.3	5.5	V
Power Consumption[5]	sleep		2	5	µW
	measuring		3		mW
	average		150		µW
Communication	digital 2-wire interface, see Communication				
Storage	10 – 50°C (0 – 80°C peak), 20 – 60%RH				

Packaging Information

Sensor Type	Packaging	Quantity	Order Number
SHT71	Tape Stripes	50	1-100092-04
SHT75	Tape Stripes	50	1-100071-04

[1] The default measurement resolution of is 14bit for temperature and 12bit for humidity. It can be reduced to 12/8bit by command to status register.

[2] Accuracies are tested at Outgoing Quality Control at 25°C (77°F) and 3.3V. Values exclude hysteresis and non-linearity.

[3] Time for reaching 63% of a step function, valid at 25°C and 1 m/s airflow.

[4] Value may be higher in environments with high contents of volatile organic compounds. See Section 1.3 of Users Guide.

[5] Values for VDD=5.5V at 25°C, average value at one 12bit measurement per second.

[6] Response time depends on heat capacity of and thermal resistance to sensor substrate.

Users Guide SHT7x

1 Application Information

1.1 Operating Conditions

Sensor works stable within recommended normal range – see Figure 4. Long term exposures to conditions outside normal range may temporarily offset the RH signal (+3 %RH after 60h). After return to normal range it will slowly return towards calibration state by itself. See Section 1.4. "Reconditioning Procedure" to accelerate eliminating the offset. Prolonged exposure to extreme conditions may accelerate ageing.

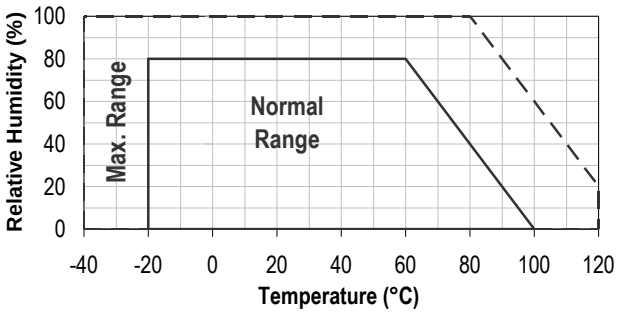


Figure 4: Operating Conditions

1.2 Sockets and Soldering

For maintain high accuracy specifications the sensor shall not be soldered. Sockets may be used such as "Preci-dip / Mill-Max 851-93-004-20-001" or similar.

Standard wave soldering ovens may be used at maximum 235°C for 20 seconds. For manual soldering contact time must be limited to 5 seconds at up to 350°C[7].

After wave soldering the devices should be stored at >75%RH for at least 12h to allow the polymer to re-hydrate.

In no case, neither after manual nor wave soldering, a board wash shall be applied. In case of application with exposure of the sensor to corrosive gases the soldering pads of pins and PCB shall be sealed to prevent loose contacts or short cuts.

1.3 Storage Conditions and Handling Instructions

It is of great importance to understand that a humidity sensor is not a normal electronic component and needs to be handled with care. Chemical vapors at high concentration in combination with long exposure times may offset the sensor reading.

For these reasons it is recommended to store the sensors in original packaging including the sealed ESD bag at following conditions: Temperature shall be in the range of 10°C – 50°C (0 – 80°C for limited time) and humidity at 20 – 60%RH (sensors that are not stored in ESD bags). For sensors that have been removed from the original packaging we recommend to stored them in ESD bags made of PE-HD[8].

In manufacturing and transport the sensors shall be prevented of high concentration of chemical solvents and long exposure times. Out-gassing of glues, adhesive tapes and stickers or out-gassing packaging material such as bubble foils, foams, etc. shall be avoided. Manufacturing area shall be well ventilated.

For more detailed information please consult the document *"Handling Instructions"* or contact Sensirion.

1.4 Reconditioning Procedure

As stated above extreme conditions or exposure to solvent vapors may offset the sensor. The following reconditioning procedure may bring the sensor back to calibration state:

Baking: 100 – 105°C at < 5%RH for 10h
Re-Hydration: 20 – 30°C at ~ 75%RH for 12h [9].

1.5 Temperature Effects

Relative humidity reading strongly depends on temperature. Therefore, it is essential to keep humidity sensors at the same temperature as the air of which the relative humidity is to be measured. In case of testing or qualification the reference sensor and test sensor must show equal temperature to allow for comparing humidity readings.

The packaging of SHT7x is designed for minimal heat transfer from the pins to the sensor. Still, if the SHT7x shares a PCB with electronic components that produce heat it should be mounted in a way that prevents heat transfer or keeps it as low as possible.

Furthermore, there are self-heating effects in case the measurement frequency is too high. Please refer to Section 3.3 for detailed information.

1.6 Light

The SHT7x is not light sensitive. Prolonged direct exposure to sunshine or strong UV radiation may age the housing.

[7] 235°C corresponds to 455°F, 350°C corresponds to 662°F

[8] For example, please check www.sirel.ch

[9] 75%RH can conveniently be generated with saturated NaCl solution. 100 – 105°C correspond to 212 – 221°F, 20 – 30°C correspond to 68 – 86°F

1.7 Materials Used for Sealing / Mounting

Many materials absorb humidity and will act as a buffer increasing response times and hysteresis. Materials in the vicinity of the sensor must therefore be carefully chosen. Recommended materials are: Any metals, LCP, POM (Delrin), PTFE, PE, PEEK, PP, PB, PPS, PSU, PVDF, PVF.

For sealing and gluing (use sparingly): High filled epoxy for electronic packaging (e.g. glob top, underfill), and Silicone. Out-gassing of these materials may also contaminate the SHT7x (see Section 1.3). therefore try to add the sensor as a last manufacturing step to the assembly, store the assembly well ventilated after manufacturing or bake at 50°C for 24h to outgas contaminants before packing.

1.8 Wiring Considerations and Signal Integrity

SHT7x are often applied using wires. Carrying the SCK and DATA signal parallel and in close proximity more than 10cm may result in cross talk and loss of communication. This may be resolved by routing VDD and/or GND between the two data signals and/or using shielded cables. Furthermore, slowing down SCK frequency will possibly improve signal integrity.

Please see the Application Note "ESD, Latchup and EMC" for more information.

1.9 ESD (Electrostatic Discharge)

ESD immunity is qualified according to MIL STD 883E, method 3015 (Human Body Model at ±2 kV).

Latch-up immunity is provided at a force current of ±100mA with T_{amb} = 80°C according to JEDEC78A. See Application Note "ESD, Latchup and EMC" for more information.

2 Interface Specifications

Pin	Name	Comment
1	SCK	Serial Clock, input only
2	VDD	Source Voltage
3	GND	Ground
4	DATA	Serial Data, bidirectional

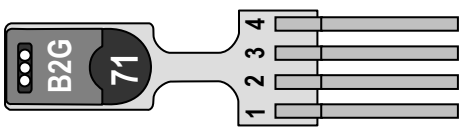


Table 1: SHT7x pin assignment.

2.1 Power Pins (VDD, GND)

The supply voltage of SHT7x must be in the range of 2.4 and 5.5V, recommended supply voltage is 3.3V. Decoupling of VDD and GND by a 100nF capacitor is integrated on the backside of the sensor packaging.

The serial interface of the SHT7x is optimized for sensor readout and effective power consumption. The sensor cannot be addressed by I²C protocol, however, the sensor can be connected to an I²C bus without interference with other devices connected to the bus. Microcontroller must switch between protocols.

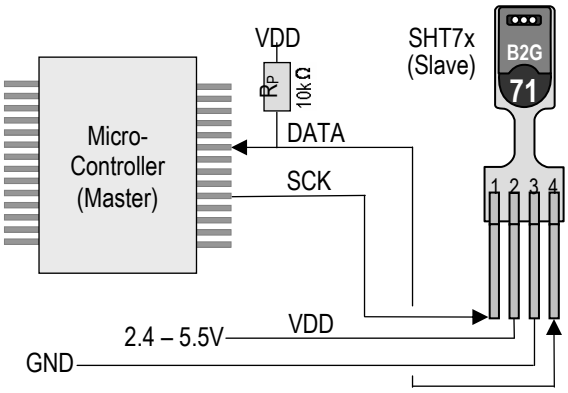


Figure 5: Typical application circuit, including pull up resistor R_P.

2.2 Serial clock input (SCK)

SCK is used to synchronize the communication between microcontroller and SHT7x. Since the interface consists of fully static logic there is no minimum SCK frequency.

2.3 Serial data (DATA)

The DATA tri-state pin is used to transfer data in and out of the sensor. For sending a command to the sensor, DATA is valid on the rising edge of the serial clock (SCK) and must remain stable while SCK is high. After the falling edge of SCK DATA may be changed. For safe communication DATA valid shall be extended T_{SU} and T_{HO} before the rising and after the falling edge of SCK, respectively – see Figure 6. For reading data from the sensor, DATA is valid T_V after SCK has gone low and remains valid until the next falling edge of SCK.

To avoid signal contention the microcontroller must only drive DATA low. An external pull-up resistor (e.g. 10 kΩ) is required to pull the signal high – it should be noted that pull-up resistors may be included in I/O circuits of microcontrollers. See Table 2 for detailed I/O characteristic of the sensor.

2.4 Electrical Characteristics

The electrical characteristics such as power consumption, low and high level, input and output voltages depend on the supply voltage. Table 2 gives electrical characteristics of SHT7x with the assumption of 5V supply voltage if not stated otherwise. For proper communication with the sensor it is essential to make sure that signal design is strictly within the limits given in Table 3 and Figure 6.

Parameter	Conditions	min	typ	max	Units
Power supply DC[10]		2.4	3.3	5.5	V
Supply current	measuring		0.55	1	mA
	average[11]	2	28		µA
	sleep		0.3	1.5	µA
Low level output voltage	I_{OL} < 4 mA	0		250	mV
High level output voltage	R_P < 25 kΩ	90%		100%	VDD
Low level input voltage	Negative going	0%		20%	VDD
High level input voltage	Positive going	80%		100%	VDD
Input current on pads				1	µA
Output current	on			4	mA
	Tri-stated (off)		10	20	µA

Table 2: SHT7x DC characteristics. R_P stands for pull up resistor, while I_{OL} is low level output current.

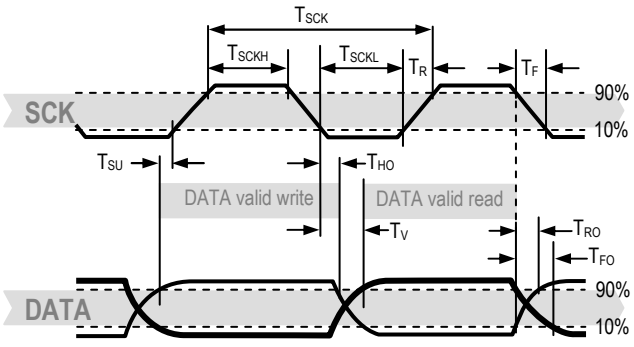


Figure 6: Timing Diagram, abbreviations are explained in Table 3. Bold DATA line is controlled by the sensor, plain DATA line is controlled by the micro-controller. Both valid times refer to the left SCK toggle.

[10] Recommended voltage supply for highest accuracy is 3.3V, due to sensor calibration.

[11] Minimum value with one measurement of 8 bit accuracy without OTP reload per second, typical value with one measurement of 12bit accuracy per second.

	Parameter	Conditions	min	typ	max	Units
F_{SCK}	SCK Frequency	VDD > 4.5V	0	0.1	5	MHz
		VDD < 4.5V	0	0.1	1	MHz
T_{SCKx}	SCK hi/low time		100			ns
T_R/T_F	SCK rise/fall time		1	200	*	ns
T_{FO}	DATA fall time	OL = 5pF	3.5	10	20	ns
		OL = 100pF	30	40	200	ns
T_{RO}	DATA rise time		**	**	**	ns
T_V	DATA valid time		200	250	***	ns
T_{SU}	DATA setup time		100	150	***	ns
T_{HO}	DATA hold time		10	15	****	ns

* $T_{R_max} + T_{F_max} = (F_{SCK})^{-1} - T_{SCKH} - T_{SCKL}$

** T_{R0} is determined by the R_P*C_{bus} time-constant at DATA line

*** T_{V_max} and T_{SU_max} depend on external pull-up resistor (R_P) and total bus line capacitance (Cbus) at DATA line

**** $T_{H0_max} < T_V - \max(T_{R0}, T_{F0})$

Table 3: SHT7x I/O signal characteristics, OL stands for Output Load, entities are displayed in Figure 6.

3 Communication with Sensor

3.1 Start up Sensor

As a first step the sensor is powered up to chosen supply voltage VDD. The slew rate during power up shall not fall below 1V/ms. After power-up the sensor needs 11ms to get to Sleep State. No commands must be sent before that time.

3.2 Sending a Command

To initiate a transmission, a Transmission Start sequence has to be issued. It consists of a lowering of the DATA line while SCK is high, followed by a low pulse on SCK and raising DATA again while SCK is still high – see Figure 7.

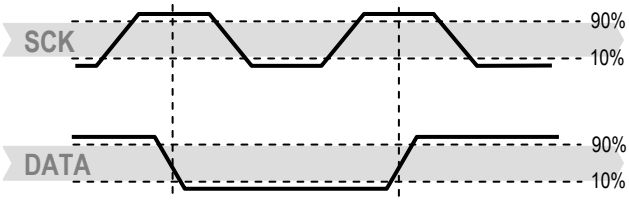


Figure 7: "Transmission Start" sequence

The subsequent command consists of three address bits (only '000' is supported) and five command bits. The SHT7x indicates the proper reception of a command by pulling the DATA pin low (ACK bit) after the falling edge of the 8th SCK clock. The DATA line is released (and goes high) after the falling edge of the 9th SCK clock.

Command	Code
Reserved	0000x
Measure Temperature	**00011**
Measure Relative Humidity	**00101**
Read Status Register	00111
Write Status Register	00110
Reserved	0101x-1110x
Soft reset, resets the interface, clears the status register to default values. Wait minimum 11 ms before next command	**11110**

Table 4: SHT7x list of commands

3.3 Measurement of RH and T

After issuing a measurement command ('00000101' for relative humidity, '00000011' for temperature) the controller has to wait for the measurement to complete. This takes a maximum of 20/80/320 ms for a 8/12/14bit measurement. The time varies with the speed of the internal oscillator and can be lower by up to 30%. To signal the completion of a measurement, the SHT7x pulls data line low and enters Idle Mode. The controller must wait for this Data Ready signal before restarting SCK to readout the data. Measurement data is stored until readout, therefore the controller can continue with other tasks and readout at its convenience.

Two bytes of measurement data and one byte of CRC checksum (optional) will then be transmitted. The micro controller must acknowledge each byte by pulling the DATA line low. All values are MSB first, right justified (e.g. the 5th SCK is MSB for a 12bit value, for a 8bit result the first byte is not used).

Communication terminates after the acknowledge bit of the CRC data. If CRC-8 checksum is not used the controller may terminate the communication after the measurement data LSB by keeping ACK high. The device automatically returns to Sleep Mode after measurement and communication are completed.

Important: To keep self heating below 0.1°C, SHT7x should not be active for more than 10% of the time – e.g. maximum one measurement per second at 12bit accuracy shall be made.

3.4 Connection reset sequence

If communication with the device is lost the following signal sequence will reset the serial interface: While leaving DATA high, toggle SCK nine or more times – see Figure 8. This must be followed by a Transmission Start sequence preceding the next command. This sequence resets the interface only. The status register preserves its content.

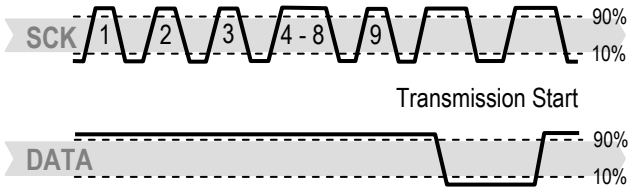


Figure 8: Connection Reset Sequence

3.5 CRC-8 Checksum calculation

The whole digital transmission is secured by an 8bit checksum. It ensures that any wrong data can be detected and eliminated. As described above this is an additional feature of which may be used or abandoned.

Please consult Application Note "CRC-8 Checksum Calculation" for information on how to calculate the CRC.

3.6 Status Register

Some of the advanced functions of the SHT7x such as selecting measurement resolution, end of battery notice or using the heater may be activated by sending a command to the status register. The following section gives a brief overview of these features. A more detailed description is available in the Application Note "Status Register".

After the command Status Register Read or Status Register Write – see Table 4 – the content of 8 bits of the status register may be read out or written. For the communication compare Figures 9 and 10 – the assignation of the bits is displayed in Table 5.



Figure 9: Status Register Write



Figure 10: Status Register Read

Examples of full communication cycle are displayed in Figures 11 and 12.

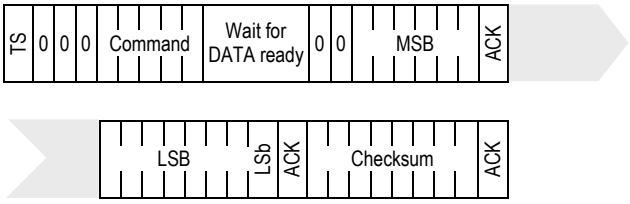


Figure 11: Overview of Measurement Sequence. TS = Transmission Start, MSB = Most Significant Byte, LSB = Last Significant Byte, LSb = Last Significant Bit.

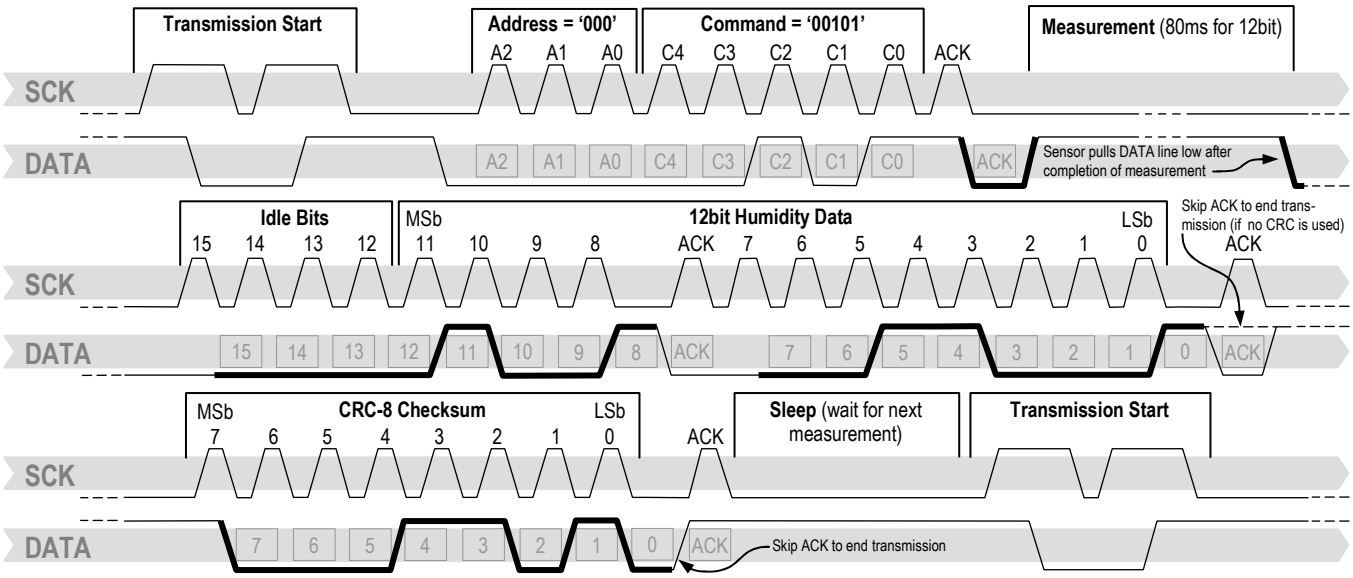


Figure 12: Example RH measurement sequence for value "0000'1001"0011'0001" = 2353 = 75.79 %RH (without temperature compensation). DATA valid times are given and referenced in boxes on DATA line. Bold DATA lines are controlled by sensor while plain lines are controlled by the micro-controller.

Bit	Type	Description	Default	
7		reserved	0	
6	R	End of Battery (low voltage detection) '0' for VDD > 2.47 '1' for VDD < 2.47	X	No default value, bit is only updated after a measurement
5		reserved	0	
4		reserved	0	
3		For Testing only, do not use	0	
2	R/W	Heater	0	off
1	R/W	no reload from OTP	0	reload
0	R/W	'1' = 8bit RH / 12bit Temp. resolution '0' = 12bit RH / 14bit Temp. resolution	0	12bit RH 14bit Temp.

Table 5: Status Register Bits

Measurement resolution: The default measurement resolution of 14bit (temperature) and 12bit (humidity) can be reduced to 12 and 8bit. This is especially useful in high speed or extreme low power applications.

End of Battery function detects and notifies VDD voltages below 2.47 V. Accuracy is ±0.05 V.

Heater: An on chip heating element can be addressed by writing a command into status register. The heater may increase the temperature of the sensor by 5 – 10°C[12] beyond ambient temperature. The heater draws roughly 8mA @ 5V supply voltage.

For example the heater can be helpful for functionality analysis: Humidity and temperature readings before and after applying the heater are compared. Temperature shall increase while relative humidity decreases at the same time. Dew point shall remain the same.

Please note: The temperature reading will display the temperature of the heated sensor element and not ambient temperature. Furthermore, the sensor is not qualified for continuous application of the heater.

4 Conversion of Signal Output

4.1 Relative Humidity

For compensating non-linearity of the humidity sensor – see Figure 13 – and for obtaining the full accuracy of the sensor it is recommended to convert the humidity readout (SO_{RH}) with the following formula with coefficients given in Table 6:

$$RH_{linear} = c_1 + c_2 \cdot SO_{RH} + c_3 \cdot SO_{RH}^{\ 2} \ (\%RH)$$

SO_{RH}	c_1	c_2	c_3
12 bit	-2.0468	0.0367	-1.5955E-6
8 bit	-2.0468	0.5872	-4.0845E-4

Table 6: Optimized V4 humidity conversion coefficients

The values given in Table 6 are newly introduced and provide optimized accuracy for V4 sensors along the full measurement range. The parameter set c_x*, which has been proposed in earlier datasheets, which was optimized

[12] Corresponds to 9 – 18°F

for V3 sensors, still applies to V4 sensors and is given in Table 7 for reference.

SO_{RH}	c_1*	c_2*	c_3*
12 bit	-4.0000	0.0405	-2.8000E-6
8 bit	-4.0000	0.6480	-7.2000E-4

Table 7: V3 humidity conversion coefficients, which also apply to V4.

For simplified, less computation intense conversion formulas see Application Note "RH and Temperature Non-Linearity Compensation". Values higher than 99% RH indicate fully saturated air and must be processed and displayed as 100%RH[13]. Please note that the humidity sensor has no significant voltage dependency.

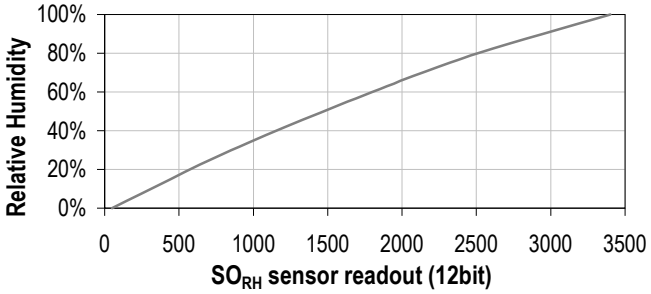


Figure 13: Conversion from SO_{RH} to relative humidity

4.2 Temperature compensation of Humidity Signal

For temperatures significantly different from 25°C (~77°F) the humidity signal requires a temperature compensation. The temperature correction corresponds roughly to 0.12%RH/°C @ 50%RH. Coefficients for the temperature compensation are given in Table 8.

$$RH_{true} = (T_{°C} - 25) \cdot (t_1 + t_2 \cdot SO_{RH}) + RH_{linear}$$

SO_{RH}	t_1	t_2
12 bit	0.01	0.00008
8 bit	0.01	0.00128

Table 8: Temperature compensation coefficients[14]

4.3 Temperature

The band-gap PTAT (Proportional To Absolute Temperature) temperature sensor is very linear by design. Use the following formula to convert digital readout (SO_T) to temperature value, with coefficients given in Table 9:

$$T = d_1 + d_2 \cdot SO_T$$

VDD	d_1 (°C)	d_1 (°F)
5V	-40.1	-40.2
4V	-39.8	-39.6
3.5V	-39.7	-39.5
3V	-39.6	-39.3
2.5V	-39.4	-38.9

SO_T	d_2 (°C)	d_2 (°F)
14bit	0.01	0.018
12bit	0.04	0.072

Table 9: Temperature conversion coefficients[15].

4.4 Dew Point

SHT7x is not measuring dew point directly, however dew point can be derived from humidity and temperature readings. Since humidity and temperature are both measured on the same monolithic chip, the SHT7x allows superb dew point measurements.

For dew point (T_d) calculations there are various formulas to be applied, most of them quite complicated. For the temperature range of -40 – 50°C the following approximation provides good accuracy with parameters given in Table 10:

$$T_d(RH,T) = T_n \cdot \frac{\ln\left(\frac{RH}{100\%}\right) + \frac{m \cdot T}{T_n + T}}{m - \ln\left(\frac{RH}{100\%}\right) - \frac{m \cdot T}{T_n + T}}$$

Temperature Range	Tn (°C)	m
Above water, 0 – 50°C	243.12	17.62
Above ice, -40 – 0°C	272.62	22.46

Table 10: Parameters for dew point (T_d) calculation.

Please note that "ln(…)" denotes the natural logarithm. For RH and T the linearized and compensated values for relative humidity and temperature shall be applied.

For more information on dew point calculation see Application Note "Dew point calculation".

5 Environmental Stability

If sensors are qualified for assemblies or devices, please make sure that they experience same conditions as the reference sensor. It should be taken into account that response times in assemblies may be longer, hence enough dwell time for the measurement shall be granted. For detailed information please consult Application Note "Qualification Guide".

[13] If wetted excessively (strong condensation of water on sensor surface), sensor output signal can drop below 100%RH (even below 0%RH in some cases), but the sensor will recover completely when water droplets evaporate. The sensor is not damaged by water immersion or condensation.

[14] Coefficients apply both to V3 as well as to V4 sensors.

[15] Temperature coefficients have slightly been adjusted compared to datasheet SHTxx version 3.01. Coefficients apply to V3 as well as V4 sensors.

SHT7x have been tested according to the test conditions given in Table 11. Sensor performance under other test conditions cannot be guaranteed and is not part of the sensor specifications. Especially, no guarantee can be given for sensor performance in the field or for customer's specific application.

Please contact Sensirion for detailed information.

Environment	Standard	Results [16]
HTOL	125°C, 1000 h	Within specifications
TC	-40°C - 125°C, 500 cycles Acc. JESD22-A104-C	Within specifications
THU	85°C / 85%RH, 1000h	Within specifications
ESD immunity	MIL STD 883E, method 3015 (Human Body Model at ±2kV)	Qualified
Latch-up	force current of ±100mA with T_{amb} = 80°C, acc. JEDEC 17	Qualified

Table 11: Qualification tests: HTSL = High Temperature Storage Lifetime, TC = Temperature Cycles, UHST = Unbiased Highly accelerated temperature and humidity Test, THU = Temperature humidity unbiased

6 Packaging

6.1 Packaging type

The device is supplied in a single-in-line pin type package. The sensor housing consists of a Liquid Crystal Polymer (LCP) cap with epoxy glob top on a standard 0.6 mm FR4 substrate. The sensor head is connected to the pins, by a small bridge to minimize heat conduction and response times. The pins are made of Cu/Be alloy coated with 1.3µm Ni and 0.5µm Au, which are soldered to the FR4 substrate by lead-free solder paste. The gold plated back side of the sensor head is connected to the GND pin. A 100nF capacitor is mounted on the back side between VDD and GND. The device is fully RoHS and WEEE compliant – thus it is free of of Pb, Cd, Hg, Cr(6+), PBB and PBDE.

Size including pins is 19.5 x 5.08 x 3.1mm. Total weight: 168 mg, weight of sensor head: 73 mg.

All pins are Au plated to avoid corrosion. They can be soldered or mate with most 1.27 mm (0.05") sockets, for example: Preci-dip / Mill-Max 851-93-004-20-001 or similar.

[16] According to accuracy and long term drift specification given on Page 2.

6.2 Traceability Information

All SHT7x are marked with an alphanumeric, three digit code on the chip cap (for reference: V3 sensors were labeled with numeric codes) – see "B2G" on Figure 1. The lot numbers allow full traceability through production, calibration and testing. No information can be derived from the code directly, respective data is stored at Sensirion.

Labels on the reels are displayed in Figures 14 and 15, they both give traceability information.

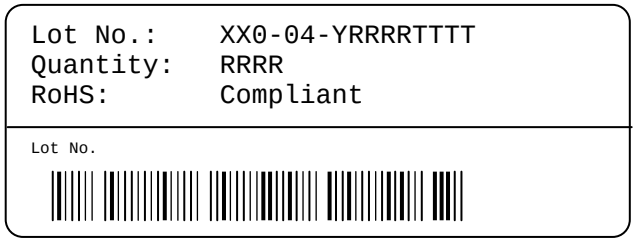


Figure 14: First label on reel: XX = Sensor Type (71 for SHT71), 04 = Chip Version (V4), Y = last digit of year, RRRR = number of sensors on reel, TTTT = Traceability Code.

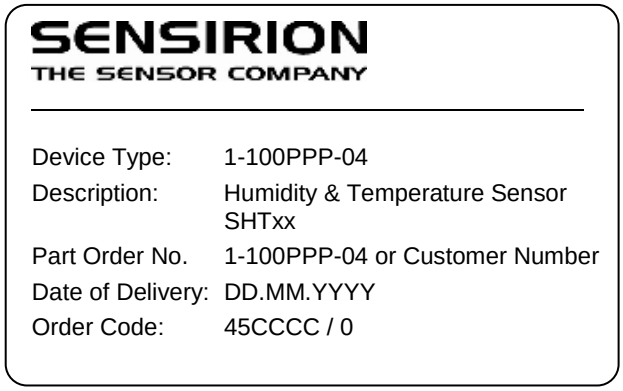


Figure 15: Second label on reel: For Device Type and Part Order Number please refer to Table 12, Delivery Date (also Date Code) is date of packaging of sensors (DD = day, MM = month, YYYY = year), CCCC = number of order.

6.3 Shipping Package

SHT7x are shipped in 32mm tape at 50pcs each – for details see Figure 16 and Table 12. Reels are individually labeled with barcode and human readable labels, see section 6.2.

Sensor Type	Packaging	Quantity	Order Number
SHT71	Tape Stripes	50	1-100092-04
SHT75	Tape Stripes	50	1-100071-04

Table 12: Packaging types per sensor type.

Dimensions of packaging tape is given in Figure 16. All tapes have a 7 pockets empty leader tape (first pockets of the tape) and a 7 pockets empty trailer tape (last pockets of the tape).

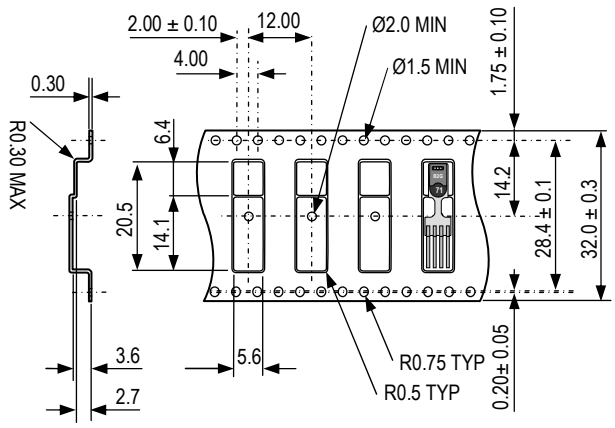


Figure 16: Tape configuration and unit orientation within tape, dimensions in mm (1mm = 0.039inch). Leader tape is to the right of the figure, trailer tape to the left.

Revision History

Date	Version	Page(s)	Changes
March 2007	3.0	1 – 10	Data sheet valid for SHTxx-V4 and SHTxx-V3
August 2007	3.01	1 – 10	Electrical characteristics added, measurement time corrected
July 2008	4.0	1 – 10	New release, rework of datasheet
July 2008	4.1	1, 4	Pin assignment corrected

Important Notices

Warning, Personal Injury

Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the data sheet and application notes. Failure to comply with these instructions could result in death or serious injury.

If the Buyer shall purchase or use SENSIRION products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless SENSIRION and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SENSIRION shall be allegedly negligent with respect to the design or the manufacture of the product.

ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.
See application note "ESD, Latchup and EMC" for more information.

Warranty

SENSIRION warrants solely to the original purchaser of this product for a period of 12 months (one year) from the date of delivery that this product shall be of the quality, material and workmanship defined in SENSIRION's published specifications of the product. Within such period, if proven to be defective, SENSIRION shall repair and/or replace this product, in SENSIRION's discretion, free of charge to the Buyer, provided that:

- notice in writing describing the defects shall be given to SENSIRION within fourteen (14) days after their appearance;
- such defects shall be found, to SENSIRION's reasonable satisfaction, to have arisen from SENSIRION's faulty design, material, or workmanship;
- the defective product shall be returned to SENSIRION's factory at the Buyer's expense; and
- the warranty period for any repaired or replaced product shall be limited to the unexpired portion of the original period.

This warranty does not apply to any equipment which has not been installed and used within the specifications recommended by SENSIRION for the intended and proper use of the equipment. EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH HEREIN, SENSIRION MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO THE PRODUCT. ANY AND ALL WARRANTIES, INCLUDING WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED AND DECLINED.
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Headquarter and Sales Offices

Headquarter
SENSIRION AG
Laubisruetistr. 50
CH-8712 Staefa ZH
Switzerland
Phone: + 41 (0)44 306 40 00
Fax: + 41 (0)44 306 40 30
info@sensirion.com
http://www.sensirion.com/

Sales Office USA:
SENSIRION Inc.
2801 Townsgate Rd., Suite 240
Westlake Village, CA 91361
USA
Phone: 805 409 4900
Fax: 805 435 0467
michael.karst@sensirion.com
http://www.sensirion.com/

Sales Office Korea:
SENSIRION KOREA Co. Ltd.
#1414, Anyang Construction Tower B/D,
1112-1, Bisan-dong, Anyang-city
Gyeonggi-Province
South Korea
Phone: 031 440 9925~27
Fax: 031 440 9927
info@sensirion.co.kr
http://www.sensirion.co.kr

Sales Office Japan:
SENSIRION JAPAN Co. Ltd.
Postal Code: 108-0074
Shinagawa Station Bldg. 7F,
4-23-5, Takanawa, Minato-ku
Tokyo, Japan
Phone: 03 3444 4940
Fax: 03 3444 4939
info@sensirion.co.jp
http://www.sensirion.co.jp

Find your local representative at: http://www.sensirion.com/reps