Transitioning from SHT7x to SHT85

Feature Comparison and High Level Integration Guide

Summary

The SHT7x is not recommended for new designs and will be succeeded by the SHT85. The last order date for the SHT7x is 31 December 2018 and the last delivery date is 31 December 2019. It is recommended to further process the SHT7x sensors within 2 years after date of delivery.

The functionality of the SHT85 covers the functionality of the SHT7x, and has a number of additional benefits. The SHT85 is pin-compatible and has a similar form factor to the SHT7x series. The SHT85 is equipped with a completely new and optimized humidity and temperature chip, which allows for increased reliability and improved accuracy specifications. The more robust and reliable design makes integration and replacement easier. Some key features of the SHT7x and SHT85 are compared below:

Parameter	SHT85	SHT7x
Product dimensions (mm^3)	17.8 x 4.9 x 2.1	19.5 x 5.08 x 3.1
Pin-assignment and pitch	Identical	
Interface	I2C	Digital Sbus
Typical application circuit	$R_{pull\ up}$ on SDA and SCL	$R_{pull\ up}$ on SDA
Filter membrane	Standard included	Not available
VDD Range (V)	2.15 to 5.5	2.4 to 5.5
Typ. RH accuracy (%)	±1.5 @0-80%RH	SHT71: ±3 @20-80% RH SHT75: ±1.8 @10-90%RH
Typ. T accuracy (°C)	±0.1 @20-50°C	±0.3 @25°C

To transition from the SHT7x to the SHT85, firmware changes are required as all newest generation CMOSens® chips use I2C. Although the typical application circuit uses a pull-up resistor on both the SDA (data line) and SCL (clock line), it is possible to drive the SCL pin by a push-pull circuit without pull-up resistor. Furthermore, hardware changes may be required due to changes in the packaging dimensions.

This guide does not intend to list all differences between both products, nor is it a fully comprehensive manual on how to do the integration of the SHT85. For a full overview of the specifications and functionality, please refer to the SHT85 datasheet.

Content

1 Comparing SHT7x with SHT85

The SHT7x is a legacy product, based on Sensirion's first generation of humidity and temperature sensor chip. The digital SHT3x humidity sensor series builds on a completely new and optimized CMOSens® chip, allowing for increased reliability and improved accuracy specifications. With the SHT85, our newest generation sensor is offered with pin-type connector. In the next table, the SHT85 is compared with the SHT75, the most used product variant of the SHT7x.

Parameter	SHT85	SHT75
Product Status	Final samples available SOP: Nov 2018	Not recommended for new designs Last order date: 31 December 2018 Last delivery date: 31 December 2019
Packaging		
Product dimensions	17.8 x 4.9 x 2.1	19.5 x 5.08 x 3.1
Pin-assignment	Identical	
Pin pitch	Identical	
Socket recommendations	Identical	
Traceability information	No code on cap, device-specific serial number that can be read out via I2C	Alphanumeric, three digit code on the chip cap
Communication and Signal Conversion		
Communication	I2C	Digital Sbus
Output	Calibrated, linearized and temperature compensated digital output	Calibrated digital output
Signal conversion to RH (%) or T(°C)	Conversion formula	Conversion formula with compensation for temperature and non-linearity
Humidity Sensor Specifications		
Typ. RH accuracy	±1.5 @0-80%RH	±1.8 @10-90%RH
Max. RH accuracy	±1.8 @0-80%RH	±1.8 @10-90%RH
Typ. RH repeatability (%RH)	Low: 0.21 Medium: 0.15 High: 0.08	0.1
RH response time	Identical	
RH range	Identical	
Temperature Sensor Specifications		
Typ. T accuracy (°C)	±0.1 @20-50°C	±0.3 @25°C
Typ. T resolution (°C)	Identical[1]	
Typ. T repeatability (°C)	Low: 0.15 Medium: 0.08 High: 0.04	0.1
T operating range (°C)	-40 to 105[2]	-40 to 123.8
Electrical Specifications		
Supply voltage (V)	2.15 to 5.5	2.4 to 5.5
Supply current measuring (µA)[3]	600	470
Average current consumption (µA)[4]	1.7	24

[1] Values identical when using a 14-bit measurement with the SHT75.

[2] All parts, incl. PCB are rated up to 125°C, except for the connector, which is rated for 105°C.

[3] Values using 3.3V supply voltage. The SHT85 has higher supply current while measuring, but lower average current consumption, because of the shorter measurement duration.

[4] Values for one measurement per second using 3.3V supply voltage.

Timing Specifications		
Time between V_{DD} reaching V_{PU} and sensor entering idle state (ms)	1.5	11
Max. RH measurement duration (ms)	15.5 [5]	80 [6]

Table 1 Comparing specifications of the SHT85 with SHT75.

2 Firmware changes

When transitioning from the SHT7x to SHT85 the firmware needs to be changed. The SHT7x series use Ditigal Sbus, which is an outdated communication protocol. All new generation Sensirion sensors use I2C, the standard communication interface in the industry. Communication is identical to the SHT3x-DIS, but some features of the SHT3x are not available for the SHT85 as the ADDR, ALERT and nRESET pins of the SHT3x-DIS component are not routed to the connector pins of the SHT85. Sample code for the SHT85 is available for download at GitHub, see Table 2.

Document Name	Description	Source
Sample Code Humidity Sensor SHT85	I2C sample code for communication with the SHT85 Humidity and Temperature Sensor through the I2C Interface	Available for download at https://github.com/Sensirion/sht85-stm-sample-project

Table 2 SHT85 Sample Code

[5] Value for a RH measurement with a resolution of 0.01 %RH and in high repeatability mode (typ. 0.08 %RH)
[6] Value for a 12-bit RH measurement with resolution 0.05 %RH and typ. repeatability of 0.1 %RH.

3 Change in packaging design

The SHT85 has a design which is superior to the SHT7x. The more robust and reliable connector makes integration and replacement easier. Furthermore, the completely flat backside allows design-in on a flat surface. To achieve these design changes, slight adaptations in package size are required. The SHT85 is pin-compatible with the SHT7x and can, like the SH7x, be soldered or mated with most 1.27 mm (0.05'') sockets. See the figures below for the detailed drawings of the dimensions of the SHT7x and SHT85.
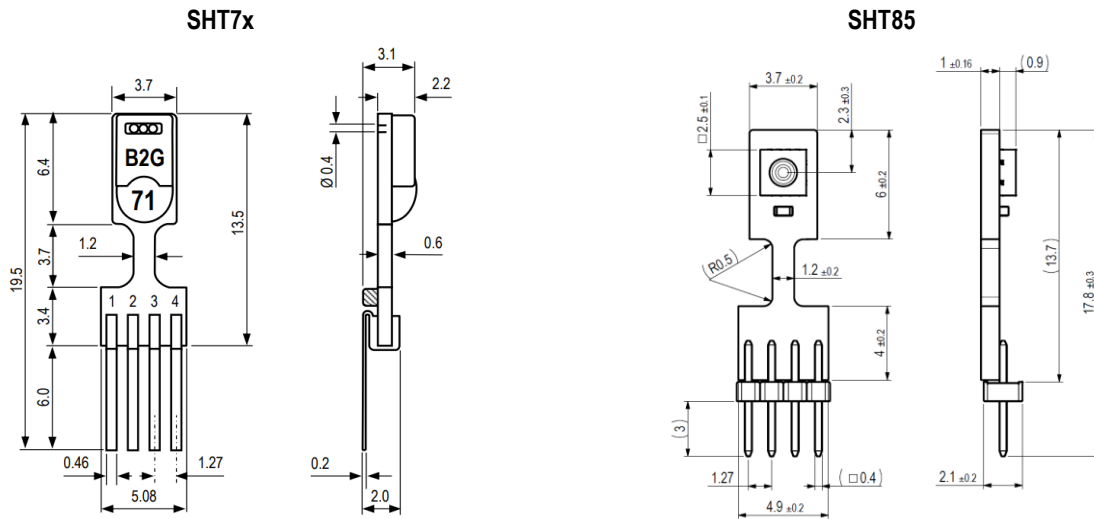
SHT7x   SHT85

Figure 1 Dimensional drawings of the SHT7x (left, applies to SHT71 and SHT75) and SHT85 (right). Dimensions are in mm (1mm = 0.039 inch).

4 Changes in Application Circuit

The SHT7x uses Digital SBus as communication interface and the application circuit requires a pull up resistor only on the data line. The SHT85 uses I2C as communication interface. I2C interfaces require a pull up resistor on both the SCL (clock line) and SDA (data line). Therefore, the typical application circuit for the SHT85 includes a pull up resistor on both the SCL (clock line) and SDA (data line), see Figure 2. However, to minimize hardware changes when transitioning from the SHT7x to the SHT85, it is possible to drive the SCL pin by a push-pull circuit without pull-up resistor. Important is to maintain a minimum SDA set-up time ($t_{SU;DAT}$) of 100 ns after the SDA line reached 70% of $V_{DD,max}$ to ensure the SCL line does not reach high level voltage before the SDA line, which would lead to a STOP condition. See the timing diagram in Figure 3. For more details on communication timing, please refer to the SHT85 Datasheet.

All commands described in the SHT85 Datasheet can be used without restrictions. Note that commands containing clock stretching, for example from the SHT3x-DIS datasheet or Application notes, may not be used when there is no pull-up resistance on the SCL line.
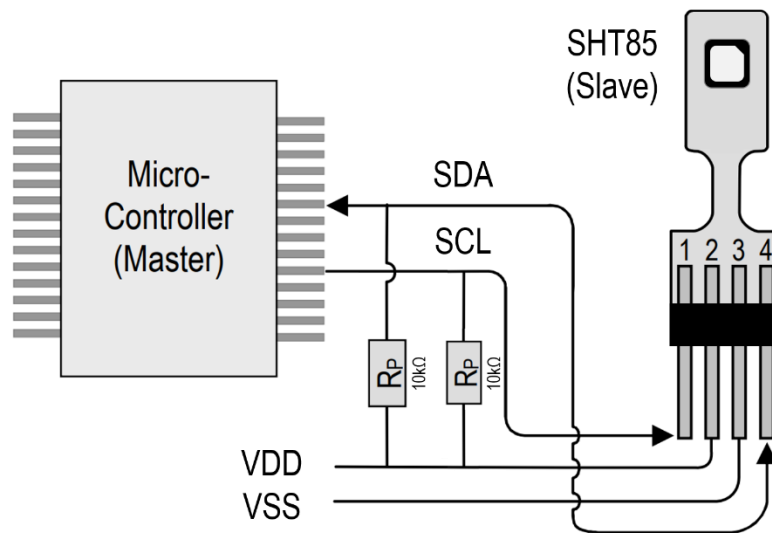

Figure 2 Typical application circuit of the SHT85.
Application circuit depends on chosen on the chosen microprocessor and communication timing.
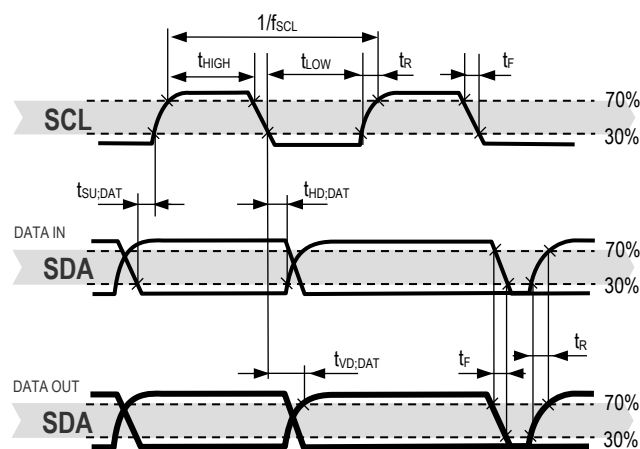

Figure 3: Timing diagram for digital input/output pads. SDA directions are seen from the sensor. Bold SDA lines are controlled by the sensor, plain SDA lines are controlled by the micro-controller.

5 Further Information

For more in-depth information on the SHT85 and its application, please consult the documents in Table 3.

Document Name	Description	Source
SHT85 Datasheet	All specifications of the SHT85	Available for download at the Sensirion humidity sensors download center: www.sensirion.com/humidity-download
SHT85 Shipping Package	Describes the standard shipping package	Available upon request
Handling of SMD Packages Humidity Sensors	Assembly Guide (Soldering Instructions)	Available for download at the Sensirion humidity sensors download center: www.sensirion.com/humidity-download
Datasheet Humidity Sensor SHT3x Digital	All specifications of the SHT35-DIS	Available for download at the Sensirion humidity sensors download center: www.sensirion.com/humidity-download
Datasheet Humidity Sensor Filter Membrane SHT3x	All relevant specifications of the filter membrane	Available for download at the Sensirion humidity sensors download center: www.sensirion.com/humidity-download
Handling Instructions Humidity Sensors	Guidelines for proper handling of SHTxx humidity sensors	Available for download at the Sensirion humidity sensors download center: www.sensirion.com/humidity-download
Specification Statement Humidity Sensors	Definition of sensor specifications.	Available for download at the Sensirion humidity sensors download center: www.sensirion.com/humidity-download

Table 3 Documents containing further information relevant for the SHT85.

6 Revision History

Date	Version	Page(s)	Changes
06. November 2018	1.0	All	Initial Release

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