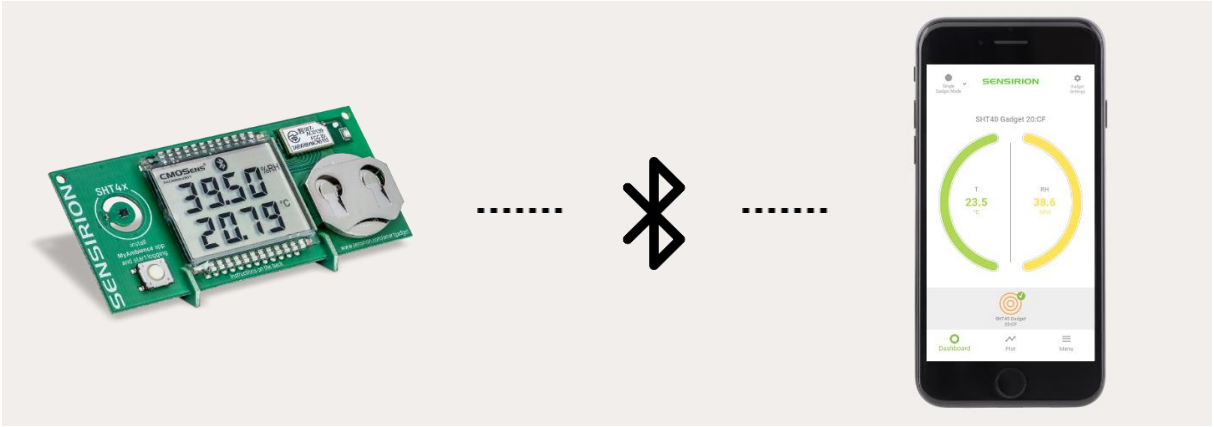
SHT4x Smart Gadget User Guide

Sensirion's Reference Design for SHT4x Sensors

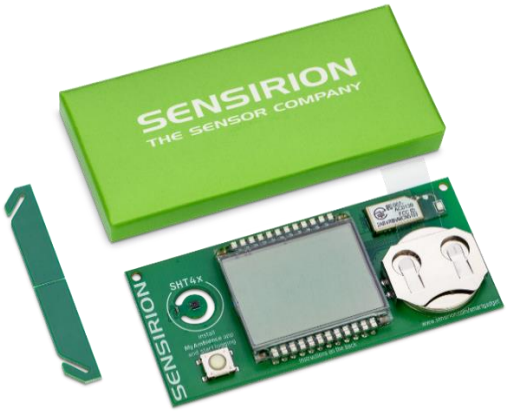


- SHT40 humidity and temperature sensor
- Liquid Crystal Display (LCD) for humidity, temperature and dew point in °C and °F
- Bluetooth Low Energy (BLE) connectivity
- iOS and Android MyAmbience app available for remote access
- Data logging and export capabilities
- Detailed hardware design resources available

Introduction

The SHT4x Smart Gadget is a simple reference design circuit board which demonstrates the outstanding performance and ease of use of Sensirion's SHT4x Humidity and Temperature sensors. It is equipped with a Liquid Crystal Display (LCD) showing humidity and temperature information. It also features a Bluetooth Low Energy (BLE) module allowing it to communicate with BLE capable devices like smartphones.

Development Kit Contents



- **Smart Gadget** equipped with SHT40 sensor, LCD, push button and BLE capable MCU module, including battery, and supports.
- **MyAmbience app** for iOS and Android devices available for download in respective application stores.
- Detailed **hardware design resources** (PCB layout, BOM) available on GitHub.

Contents

1 Quick Start Guide

1. Getting Started

- Remove battery foil
- Break apart supports and slide main board into slots

2. Standalone Operation

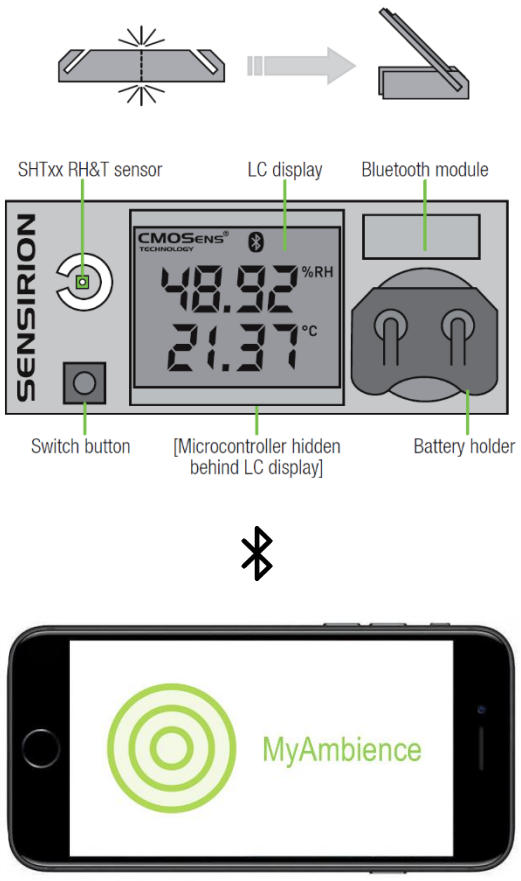
- RH&T values are shown on the LCD
- Switch between RH and dew point by pressing the button

3. Enabling/Disabling Bluetooth

- Bluetooth is enabled by default
- With Bluetooth enabled (indicated by Bluetooth symbol on LCD) the gadget is ready to pair with a Bluetooth device
- To disable/enable Bluetooth, press the button for >2 seconds

4. Operation with MyAmbience App

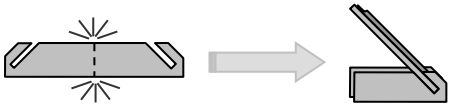
- Download iOS or Android version of the MyAmbience app on your smartphone
- Open the App to automatically see nearby smart gadgets on your smartphone



2 Standard Operations

2.1 Assembly Instructions

Take the two supports and break them apart. Slide the circuit board into the slots in the supports, with one support on each side of the Liquid Crystal Display. Remove battery insulation foil. Optionally, the temperature can be displayed in °F by pressing the button while inserting the battery.



2.2 Operating in Standalone Mode

This is the default operating mode. The measured values are shown on the Liquid Crystal Display. The upper line shows relative humidity or dew point temperature, while the lower line shows temperature. To switch between relative humidity and dew point display, briefly press the button. To display temperature values in °F, press the button while inserting the battery.

2.3 Operation in Bluetooth Mode

Bluetooth mode is enabled by default. When Bluetooth mode is enabled, the Bluetooth symbol in the display is shown and the SHT4x Smart Gadget is visible for master devices. It is then possible for a master device running MyAmbience app to establish a connection to the Smart Gadget. To change Bluetooth mode (disabling or enabling), press the button for more than 2 seconds. When turning on Bluetooth, the device ID (in the format XX:XX) is shown on the display for a short time. The battery life is improved when the Bluetooth mode is disabled.

2.4 Connecting to a Bluetooth Device

To connect the Smart Gadget to a smartphone, the smartphone must have MyAmbience app installed and Bluetooth enabled. For Android devices, location permission needs to be granted to the app for it to work, although the user location will not be used at any time. The app will automatically connect to surrounding Smart Gadgets with Bluetooth enabled. To display values from a specific Smart Gadget, the corresponding Smart Gadget has to be selected in the list of connected gadgets. The MyAmbience app can be downloaded from the corresponding app stores:

iOS (Apple iTunes Store): https://apps.apple.com/app/sensirion-myambience/id1529131572

Android (Google Play Store): https://play.google.com/store/apps/details?id=com.sensirion.myam

2.5 Using the Smart Gadget as a Datalogger

The Smart Gadget stores the measurement values in the built-in memory. The measurement interval can be defined through the app in the “Gadget Settings” menu. The Smart Gadget will log measurement values even if the Bluetooth connection is terminated. The stored values can be downloaded, displayed on the smartphone via the app, or exported as .edf files.

2.6 System Requirement

In order for a mobile device to work with the Smart Gadget it needs to be Bluetooth 4.0 (also known as Bluetooth Low Energy or BLE) compatible. This is the case for most Android devices from 2013 and newer, Apple iPhones generation 4S and newer, and Apple iPad generation 3 and newer. The Smart Gadget apps run with Android 4.4 or later and iOS 9.0 or later, respectively.

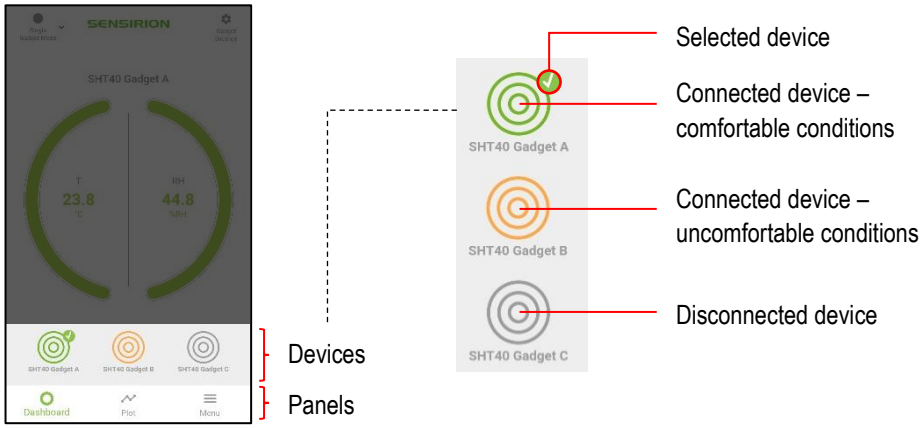
2.7 Important Security Advice

- Keep out of reach of children and pets (contains swallowable parts)
- If any part is swallowed, contact a physician immediately
- Battery type: CR2032
- Dispose of the battery properly (special waste)
- Smart Gadget operating temperature range: -10 to 60 °C
- The Smart Gadget is intended for indoor use
- The Smart Gadget is sensitive to electrostatic discharge (ESD) – please take precautions

3 MyAmbience Application

3.1 Device selection

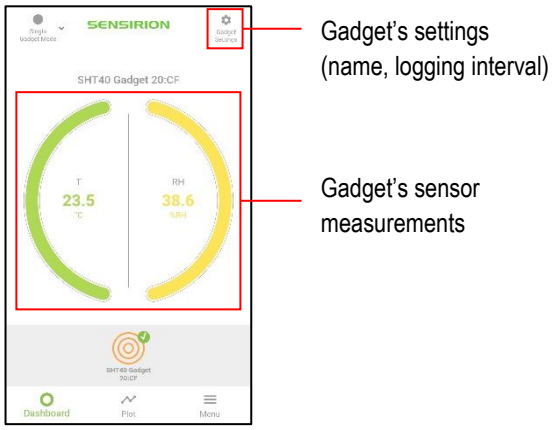
When Bluetooth is enabled, MyAmbience automatically scans for devices to connect with. When in the dashboard or plot panels, the devices which are connected to the application are displayed as concentric circles with the gadget's name underneath. Press on a device to select it. The selected device has a check mark on it and its information will be displayed in the dashboard or plot panel.



When the gadget logo (concentric circles) is green, it means that the environmental conditions measured by the gadget are deemed comfortable. If a device was connected during the runtime of the application but the connection is subsequently lost, the device logo will appear as grey in the list.

3.2 Dashboard Panel

The dashboard view displays the summary information of the Gadget's sensor readings. The colors for each signal (yellow, green, blue) indicate the level of environmental comfort based on the signal's value. "Cold" temperatures (<20°C) are indicated in blue, comfortable ones in green, and "hot" ones (>26°C) in yellow. Low relative humidity (<40%RH) (i.e. dry air) is indicated in yellow, comfortable relative humidity is indicated in green, and high relative humidity (>60%RH) in blue.



	Temperature	Relative Humidity
Dry / hot	> 26°C	0 – 40 %RH
Comfortable	20 – 26°C	40 – 60 %RH
Cold / humid	< 20°C	60 – 100 %RH

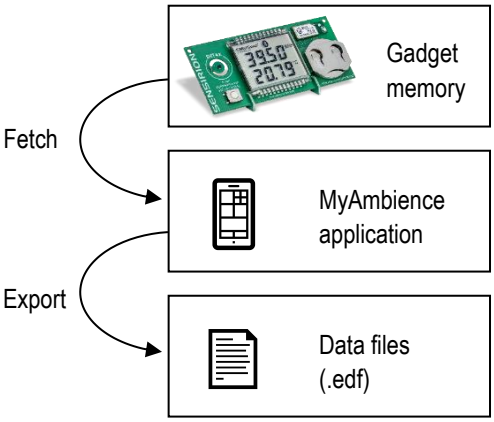
On the upper-right corner, one can access the gadget settings to change the gadget name and the logging interval with which the gadget should internally store the measured environmental data for later download.

3.3 Plot Panel

In the plot panel it is possible to plot the evolution of the environmental signals through time. One can change the signal to be displayed (temperature, relative humidity, etc) and the time scale of the graph. On the top-right corner, the Fetch Data button allows to download environmental data stored in the gadget's memory, according to the configured logging interval. The downloaded data can then be displayed on a graph. Next to the Fetch Data button, the Export button enables to save and send the recorded data as a .edf file.

Fetch and Export functions

Time plot of Gadget's measurements



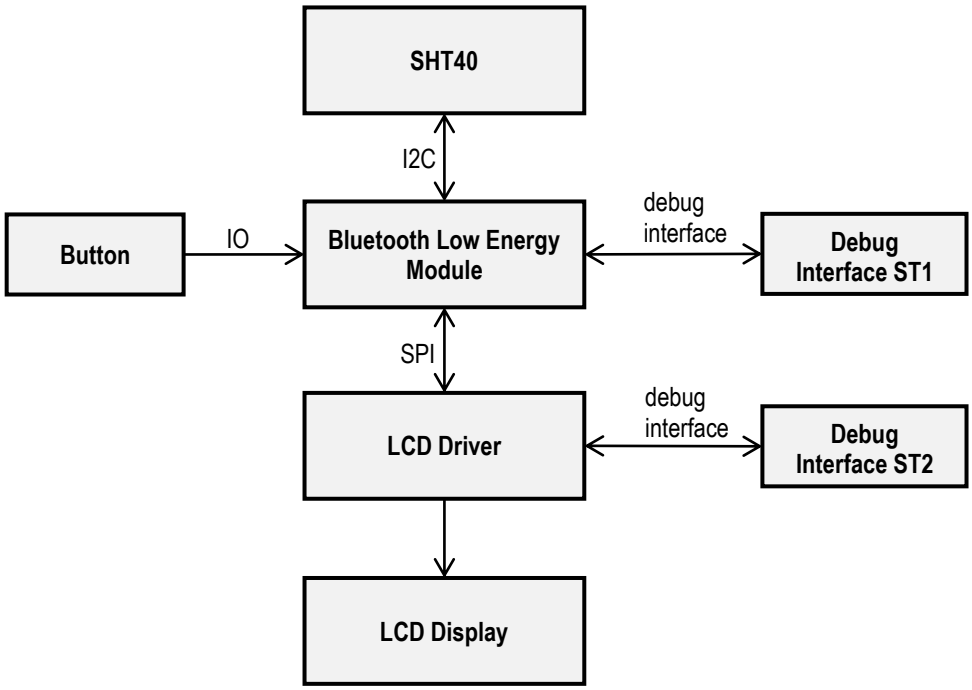
3.4 Menu Panel

In the menu panel, it is possible to find various information about the application and to load / export / manage logged data. Under the App Settings section, it is possible to change the temperature units (°C, °F, K), and to select other metrics to display (dew point, heat index, absolute humidity) in the Dashboard and Plot panel.

4 Hardware resources

Hardware design data (PCB layout, schematics, BOM) are published on Sensirion GitHub page:
https://github.com/Sensirion/smartgadget-sht4x-hardware

4.1 Block Diagram

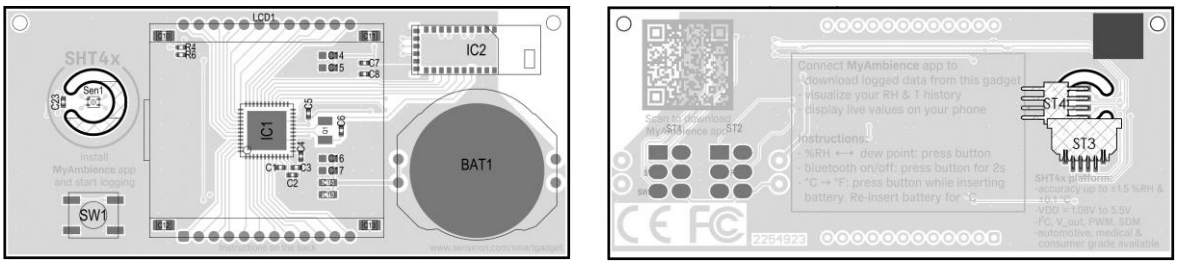


4.2 Bill of Materials

Component	Type	Qty.	Designator	Footprint	Manufacturer	Manufacturer Part Number
RH&T Sensor	SHT40-AD1B	1	SEN1	SHT4x-xD1	Sensirion AG	SHT40-AD1B-R2
BLE Module	BVMCN5103	1	IC2	BVMCN5103_Small	Braveridge	BVMCN5103-CEAA-BK
LCD driver	MC9S08LL8CGT	1	IC1	QFN50P700X700X80_HS-49N	NXP - Freescale Semiconductor	MC9S08LL8CGT
LCD Display	LCD	1	LCD1	LCD_1209061_A2	AV Display	LCD_1209061_A2
Battery holder	For CR2032 batteries	1	BAT1	BAT-HLD-001-THM	Linx Technologies	BAT-HLD-001-THM
Switch	Switch	1	SW1	SW_EVQQ2P02W	Panasonic Electronic Components	EVQ-Q2P02W
Crystal	ABS07-32.768KHZ-T	1	Q1	XTAL_ABS07	Abracon LLC	ABS07-32.768KHZ-T
Capacitors	100nF, 10V/X7R	9	C1, C2, C3, C4, C5, C6, C7, C8, C23	C_0402	n/a	n/a

Component	Type	Qty.	Designator	Footprint	Manufacturer	Manufacturer Part Number
Capacitors	For display support, no electrical function	4	C10, C11, C12, C13	C_0805	n/a	n/a
Capacitors	22uF, 6V3/X5R	4	C14. C15, C16, C17	C_0603	n/a	n/a
Resistors	10kOhm, 1%	2	R4, R6	R_0402	n/a	n/a

4.3 PCB Layout



5 Version History

Date	Revision	Changes
10. May 2021	1	Initial version

