

Optimization of Sensor Output Repeatability

For SHTC1, SHTW2 and STSC1 Humidity and Temperature Sensors

Introduction

This application note describes ways of optimizing sensor output repeatability for SHTC1, SHTW2 and STSC1 by minimizing activity on the SCL line during measurement of the sensor. Repeatability of the sensor output is especially critical when accuracy crucial or the sensor outputs are used for signal post-processing. For reasons of simplicity, the text below refers to SHTC1, but the document also applies to SHTW2 and STSC1 sensors (the exception are humidity related parts which don't apply to STS sensors).

Sensitivity to I²C Bus Activity

The repeatability of the SHTC1 physical output signals (humidity and temperature) may be affected when there is activity on the SCL line during the period in which the sensor is measuring. The relevant time window has a length of 15 ms and starts right after the SHTC1 has acknowledged the measurement command.

The more activity there is on the SCL line during this time window, the higher the noise on the output signal. In order to avoid increased noise on the output signal it is recommended avoid or at least reduce communication during measurement of the SHTC1.

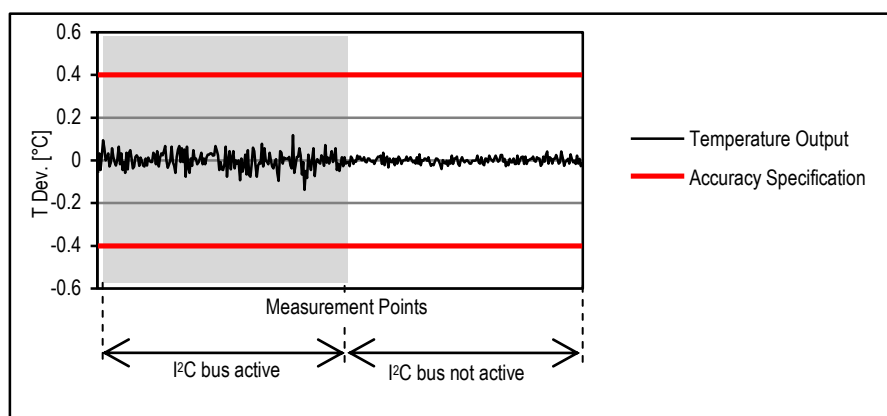


Figure 1 Comparison of temperature repeatability with and without activity on the I²C bus during measurement. On the left side, the I²C bus is constantly busy while SHTC1 is measuring (worst case). On the right side, the I²C bus is not active while the SHTC1 is measuring.

Recommendations

In the following, 3 recommendations are given to optimize repeatability of the SHTC1 output signals. Recommendation A is the most effective option, recommendation B the second most and C is the least effective.

A. No Communication during Measurement

For best possible repeatability of the output signals, there should not be any communication (with the SHTC1 or any other slave device) on the I²C bus during a time window of 15 ms (this is the max. measurement time). Therefore, it's recommended that the master waits for 15 ms after receiving the ACK bit for the measurement command from the SHTC1 before issuing a STOP condition and starting over with communication.

Optimization of Sensor Output Repeatability

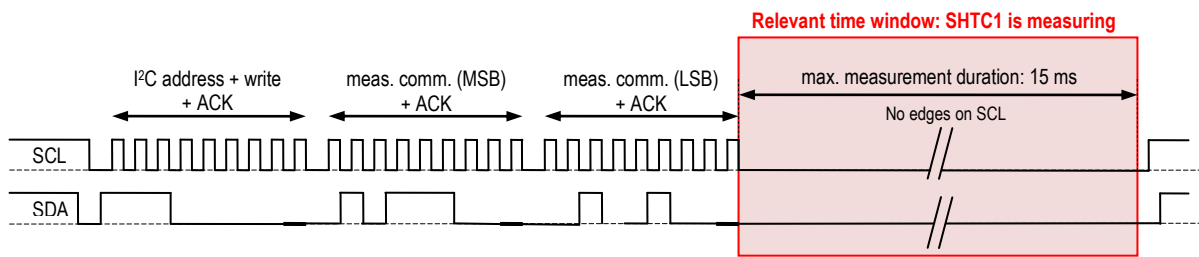


Figure 2 In the relevant time window it is recommended to avoid or at least reduce communication on the I²C bus.

B. Clock Stretching

A possibility to make sure that there is only a minimum of communication during measurement of the SHTC1 is to enable clock stretching by selecting a corresponding measurement command and sending a read command right after the measurement command. Upon receiving the read command, the SHTC1 will pull low the SCL line and prevent any activity on the SCL line as long as it is measuring.

C. Reduced Communication during Measurement

If it's not possible to avoid communication during the critical time window, then at least the activity on the SCL line should be kept at a minimum, i.e. to have as few edges on SCL as possible.

Revision history

Date	Revision	Changes
06 May 2013	1	Initial release
29. January 2015	2	Added SHTW1 and STSC1
06. May 2016	3	Added SHTW2, removed SHTW1

Copyright© 2016, SENSIRION.
CMOSens® is a trademark of Sensirion
All rights reserved

Headquarters and Subsidiaries

SENSIRION AG
Laubisruetistr. 50
CH-8712 Staefa ZH
Switzerland

phone: +41 44 306 40 00
fax: +41 44 306 40 30
info@sensirion.com
www.sensirion.com

Sensirion AG (Germany)
phone: +41 44 927 11 66
info@sensirion.com
www.sensirion.com

Sensirion Inc., USA
phone: +1 805 409 4900
info_us@sensirion.com
www.sensirion.com

Sensirion Japan Co. Ltd.
phone: +81 3 3444 4940
info@sensirion.co.jp
www.sensirion.co.jp

Sensirion Korea Co. Ltd.
phone: +82 31 345 0031 3
info@sensirion.co.kr
www.sensirion.co.kr

Sensirion China Co. Ltd.
phone: +86 755 8252 1501
info@sensirion.com.cn
www.sensirion.com.cn

To find your local representative, please visit www.sensirion.com/contact