

Low Power Measurement Mode

For SHTC3 Humidity and Temperature Sensor

Introduction

For applications requiring minimal power consumption, the SHTC3 provides a dedicated low power measurement mode with a specific set of commands. This application note provides specifications, information and usage examples for this measurement mode to help optimize repeatability while maintaining ultra-low power consumption.

Characteristics of the Low Power Mode

The SHTC3 provides a low power measurement mode with a specific set of commands (see Table 1). Using the low power mode significantly shortens the measurement duration and thus minimizes the energy consumption per measurement (see Table 2).

Measurement Commands for Low Power Mode			
Clock Stretching Enabled		Clock Stretching Disabled	
Read T First	Read H First	Read T First	Read H First
0x6458	0x44DE	0x609C	0x401A

Table 1 Measurement commands for low power measurement mode.

The benefit of ultra-low power consumption comes at the cost of reduced repeatability of the sensor signals: while the impact on the relative humidity signal is negligible and does not affect accuracy, it has an effect on temperature accuracy, as stated in Table 2.

Default conditions of 25 °C and 3.3 V supply voltage apply to values in the table below, unless otherwise stated.

Parameter	Low Power Mode	Normal Mode	Units
Measurement Duration	0.7	10.8	ms
Supply current during measurement	270	430	µA
Average supply current @ 1 measurement per second	0.5	4.9	µA
Average power consumption @ 1 measurement per second	1.6	16.3	µW
Energy consumption per measurement at 3.3 V	0.62	15.4	µJ
Energy consumption per measurement at 1.8 V	0.34	8.4	µJ
RH accuracy tolerance	±2.0	±2.0	%RH
T accuracy tolerance	±0.8	±0.2	°C
RH repeatability ¹	0.4	0.1	%RH
T repeatability ¹	0.4	0.1	°C

Table 2 Characteristic values for measurements in low power mode.

Note that when using the low power mode Sensirion recommends keeping the I²C bus free of communication while the SHTC3 is measuring. Activity on the SCL line during the measurement may further affect the repeatability of the sensor signals.

Usage Examples of Low Power Mode

A good way to find the best trade-off between power consumption and overall accuracy for a specific application is to alternate between measurements in low power mode and measurements in normal mode. Taking measurements in low power mode whenever conditions are not critical for the application helps save power during uncritical periods.

¹ The stated repeatability is 3 times the standard deviation (3σ) of multiple consecutive measurement values at constant conditions and is a measure for the noise on the physical sensor output.

SHTC3 Low Power Measurement Mode

Whenever conditions become critical for the application and best possible repeatability of the sensor signals is required, measurements can be taken in normal mode. See examples below for further illustration:

Example 1

Application: smart thermostat

- Take periodic measurements in low power mode to save power.
- Change to normal mode if a significant change is seen on the sensor signals (indicating that strong RH/T change is happening in the environment) to get best repeatability during critical phase.
- Change back to low power mode after environmental conditions have stabilized.

Example 2

Application: cold chain data logger

- Take periodic measurements in low power mode to save power.
- Change to normal mode if sensor readings get within 1°C of excursion limits defined by the application (e.g. 2°C low limit, 8°C high limit) in order to monitor potential excursions with best possible repeatability.
- Change back to low power mode as soon as sensor readings are back within excursion limits by 1°C.

Of course, there are many other smart ways to combine normal mode and low power mode measurements, depending on the application the sensor is used in.

Revision history

Date	Revision	Changes
May 2018	1	Initial release

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. SENSIRION is only liable for defects of this product arising under the conditions of operation provided for in the data sheet and proper use of the goods. SENSIRION explicitly disclaims all warranties, express or implied, for any period during which the goods are operated or stored not in accordance with the technical specifications.

SENSIRION does not assume any liability arising out of any application or use of any product or circuit and specifically disclaims any and all liability, including without limitation consequential or incidental damages. All operating parameters, including without limitation recommended parameters, must be validated for each customer's applications by customer's technical experts. Recommended parameters can and do vary in different applications.

SENSIRION reserves the right, without further notice, (i) to change the product specifications and/or the information in this document and (ii) to improve reliability, functions and design of this product.

Copyright © 2018, by 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 Taiwan Co. Ltd.
phone: +41 44 306 40 00
info@sensirion.com

Sensirion Inc. USA
phone: +1 312 690 5858
info-us@sensirion.com
www.sensirion.com

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

Sensirion Korea Co. Ltd.
phone: +82 31 337 7700~3
info-kr@sensirion.com
www.sensirion.co.kr

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

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