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SENSIRION
THE SENSOR COMPANY

Datasheet STC31

CO_2 Sensor Based on Thermal Conductivity

- Calibrated gas concentration and temperature output
- Next level repeatability and long term stability
- Compensates for Relative Humidity with additional SHTxx sensor

Product Summary

The STC3x sensor family is Sensirion's series of Gas Concentration sensors designed for high-volume applications. The STC3x utilizes a revolutionized thermal conductivity measurement principle, which results in superior repeatability and long-term stability. This make the STC31 a perfect choice for applications where reliability is key.
The sensor features a digital I^2C interface, which makes it easy to connect directly to a microprocessor.
The outstanding performance of these sensors is based on Sensirion's patented CMOSens® sensor technology, which combines the sensor element, signal processing and digital calibration on a small CMOS chip. The well-proven CMOS technology is perfectly suited for high-quality mass production and is the ideal choice for demanding and cost-sensitive OEM applications.

Benefits of Sensirion's CMOSens® Technology

- High reliability and long-term stability
- Best signal-to-noise ratio
- Industry-proven technology with a track record of more than 15 years
- Designed for mass production
- High process capability

Content

1. Sensor Performance 2
2. Specifications 3
3. Digital Interface Description 4
4. Physical specifications 12
5. Sensor Integration 14
6. Shipping Package 15
7. Ordering Information 15
Important Notices 16
Headquarters and Subsidiaries 16

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1. Sensor Performance

1.1 Concentration[1]

Parameter	Value	
Calibrated for[2]	CO_2 in N_2 and CO_2 in air[3]	
Measurement range[4]	0 to 25 vol%	0 to 100 vol%
Accuracy[5]	0.5 vol% + 3% measured value	1 vol% + 3% measured value
Repeatability	0.2 vol%	
Temperature stability[6]	0.025 vol% / °C	
Resolution	16 bit	

1.2 Temperature [7]

Parameter	Value
Measurement range	-20 °C to 85 °C
Resolution	16 bit
Accuracy	0.5 °C (10 °C to 50 °C) 1.5 °C (-20 °C to 85 °C)
Repeatability	0.1°C

[1] Valid at temperature at which ASC or FRC is performed and humidity = 0-95% RH / pressure = 800-1200mbar, Vdd=3.3V.

[2] Specifications are only valid for these binary gas mixtures (air is interpreted as being one type of gas).

[3] Air is defined as 78.1% nitrogen, 21.0% oxygen and 0.9% argon.

[4] Measurement range can be chosen by setting the gas model as described in 3.3.2

[5] Accuracy is defined after performing FRC at 0 vol%.providing a correct temperature, humidity and pressure measurement. Consult sections 3.3.3, 3.3.4, 3.3.5 and 5 for detailed information.

[6] Slope of CO2 accuracy when changing temperature. Fulfilled by 90% of sensors after calibration

[7] The measured temperature is the temperature of the bulk silicon in the sensor. This temperature value is not only depending on the gas temperature, but also on the sensor's surroundings. See section 5.2 for more details.

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2. Specifications

2.1 Electrical Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units	Comments
Supply Voltage	V_{DD}		2.7	3.3	5.5	V	Sensor is calibrated at 3.3V
Power-up/down level	V_{POR}		2.3	2.5	2.7	V	
Supply current	I_{DD}	Measuring		3	5	mA	
		Idle state		50		uA	
		Sleep mode			1	uA	

2.2 Timings

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units	Comments
Power-up time	t_{PU}				14	ms	Time to sensor ready
Soft reset time	t_{SR}				12	ms	Time between soft reset command or exit sleep mode and sensor ready
I2C SCL frequency	f_{I2C}			400	1000	kHz	
Measurement time concentration					66	ms	Measurement result is returned together with temperature value

2.3 Mechanical Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units	Comments
Weight	W				0.025	g	

2.4 Materials

Parameter	
REACH, RoHS	REACH and RoHS compliant

2.5 Absolute Minimum and Maximum Ratings[8]

Parameter	Rating	Units
Supply Voltage V_{DD}	-0.3 to 5.5	V
Max Voltage on pins (SDA, SCL)	-0.3 to V_{DD}+0.3	V
Input current on any pin	±70	mA
Operating temperature range	-20 to +85	°C
Storage temperature range	-20 to +85	°C
Operating absolute pressure range	600 to 1200	mbar
Max. humidity for long term exposure	40°C dew point	
ESD HBM (human body model)	2	kV
Media Compatibility	Non corrosive gases	

[8] For other ranges contact Sensirion.

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3. Digital Interface Description

The STC3x interface is compatible with the I²C protocol in Standard-mode, Fast-mode and Fast-mode Plus. Clock stretching is not supported. This chapter describes the command set for STC31. For detailed information about the I²C protocol, please check the document "NXP I²C-bus specification and user manual".

3.1 I²C Address

The default I²C address for STC31 is 0x29 (b 0101001). The address is followed by a read or write bit. See section 4.3.3 for selecting alternative I2C addresses.

3.2 I²C Sequences

The commands are 16-bit. Data is read from the sensor in multiples of 16-bit words, each followed by an 8-bit checksum to ensure communication reliability. I²C sequences can be aborted with a NACK and STOP condition.

I²C master writes 16 bit command

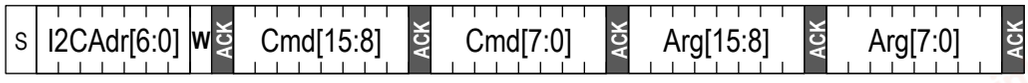


I²C master writes 16 bit command with a 16bit argument and CRC byte

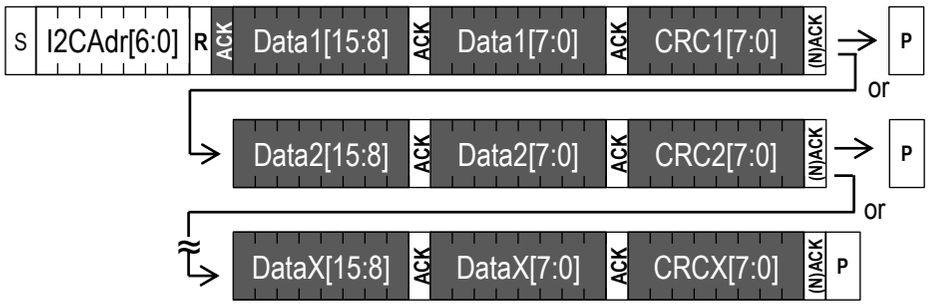


The CRC byte must be generated from the 16-bit argument. See section 3.4 for more details.

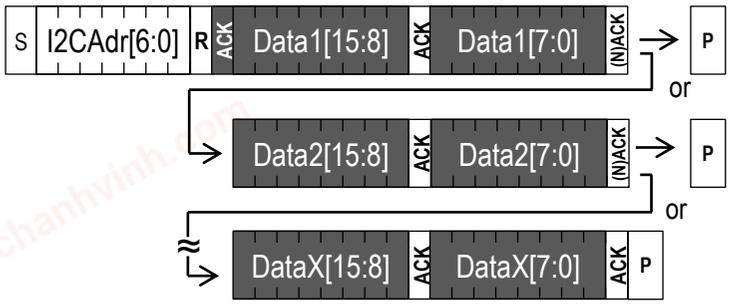
Alternatively, with CRC disabled, the I²C master writes 16 bit command with a 16bit argument



I²C master sends read header and receives multiple 16bit words with CRC byte



Alternatively, with the CRC disabled, I²C master sends read header and receives multiple 16bit words



Dark areas with white text indicate that the sensor controls the SDA (Data) line.

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3.3 I²C Commands

The command set of the STC31 consists of a set of different commands:

- Disable CRC (3.3.1)
- Set Binary Gas (3.3.2)
- Set Relative Humidity (3.3.3)
- Set Temperature (3.3.4)
- Set Pressure (3.3.5)
- Measure gas concentration (3.3.6)
- Forced recalibration (3.3.7)
- Automatic self-calibration (3.3.8)
- Automatic self-calibration in combination with sleep mode (3.3.9)
- Self-test (3.3.10)
- Soft Reset (3.3.11)
- Entering and exiting sleep mode (3.3.12)
- Read Product Identifier (3.3.13)
-

3.3.1 Disable CRC

In default mode the arguments written to the sensor and the data coming from the sensor are protected by CRC. There may be cases where it is beneficial to disable the CRC, for example to reduce the sensor overhead and general power consumption, or during the first stages of development.
In cases where the MCU and sensor are not close together on a PCB, and are for example connected with a wire, it is recommended to not disable the CRC. For safety related applications it is strongly recommended to not disable the CRC.

Command	Command code (Hex)	Description
Disable CRC	0x3768	This command disables the CRC on the data for both read and write. See section 3.2 for more details.

When the system is reset or wakes up from sleep mode, the sensor goes back to default mode, which means that the CRC is re-enabled.

3.3.2 Set Binary Gas

The STC31 measures the concentration of binary gas mixtures. It is important to note that the STC31 is not selective for gases, and it assumes that the binary gas is set correctly. The sensor can only give a correct concentration value when only the gases set with this command are present.

Command	Command code (Hex)	Argument (Hex)	Description
Set binary gas to **CO_2 in N_2** Range: 0 to 100 vol%	0x3615	0x0000	After this command, measurement results will return a concentration of CO_2 in N_2 for 0 to 100 vol% CO2
Set binary gas to **CO_2 in air** Range: 0 to 100 vol%	0x3615	0x0001	After this command, measurement results will return a concentration of CO_2 in air for 0 to 100 vol% CO2
Set binary gas to **CO_2 in N_2** Range: 0 to 25 vol%	0x3615	0x0002	After this command, measurement results will return a concentration of CO_2 in N_2 for 0 to 25 vol% CO2
Set binary gas to **CO_2 in air** Range: 0 to 25 vol%	0x3615	0x0003	After this command, measurement results will return a concentration of CO_2 in air for 0 to 25 vol% CO2

The command sequence needs to be closed off with a valid CRC byte for the 16-bit argument, if the CRC is not disabled. When the CRC byte does not match the argument, the sensor will respond with a NACK and no gas will be selected.
When the system is reset, or wakes up from sleep mode, the sensor goes back to default mode, in which no binary is selected. This means that the binary gas must be reconfigured.
When no binary gas is selected (default mode) the concentration measurement will return undefined results. This allows to detect unexpected sensor interruption (e.g. due to temporary power loss) and consequently reset the binary gas to the appropriate mixture.

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3.3.3 Set Relative Humidity

As mentioned in section 5.1, the measurement principle of the concentration measurement is dependent on the humidity of the gas. With the set relative humidity command, the sensor uses internal algorithms to compensate the concentration results.

Command	Command code (Hex)	Argument	Description
Set Relative Humidity	0x3624	Relative Humidity: 16bit unsigned integer	When no value is written to the sensor after a soft reset, wake-up or power-up, a relative humidity of 0% is assumed. The value written to the sensor is used until a new value is written to the sensor.

This command sequence needs to be closed off with a valid CRC byte for the 16-bit argument, if the CRC is not disabled. When the CRC byte does not match the argument, the sensor will respond with a NACK. The sensor will omit the command and will use the previous value, or when no value was written, assume a relative humidity of 0%.

3.3.4 Set Temperature

The concentration measurement requires a compensation of temperature. Per default, the sensor uses the internal temperature sensor to compensate the concentration results. However, when using the SHTxx, it is recommended to also use its temperature value, because it is more accurate.

Command	Command code (Hex)	Argument	Description
Set Temperature	0x361E	Temperature: 16bit signed integer (two's complement number)	When no value is written to the sensor after a soft reset, wake-up or power-up, the internal temperature signal is used. The value written to the sensor is used until a new value is written to the sensor.

This command sequence needs to be closed off with a valid CRC byte for the 16-bit argument, if the CRC is not disabled. When the CRC byte does not match the argument, the sensor will respond with a NACK. The sensor will omit the command and will use the internal temperature signal.

3.3.5 Set Pressure

A pressure value can be written into the sensor, for density compensation of the gas concentration measurement. It is recommended to set the pressure level, if it differs significantly from 1013mbar. Pressure compensation is valid from 600mbar to 1200mbar.[9]

Command	Command code (Hex)	Argument	Description
Set Pressure	0x362F	Absolute pressure: 16bit unsigned integer	When no value is written to the sensor after a soft reset, wake-up or power-up, a pressure of 1013mbar is assumed. The value written is used until a new value is written to the sensor.

This command sequence needs to be closed off with a valid CRC byte for the 16-bit argument, if the CRC is not disabled. When the CRC byte does not match the argument, the sensor will respond with a NACK. The sensor will omit the command and will use the previous value, or when no value was written, assume the default value of 1013mbar.

[9] For other ranges contact Sensirion.

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3.3.6 Measure Gas Concentration

The measurement of gas concentration is done in one measurement in a single shot, and takes less than 66ms.
When measurement data is available, it can be read out by sending an I²C read header and reading out the data from the sensor.
If no measurement data is available yet, the sensor will respond with a NACK on the I²C read header.
In the table below the data layout of the results can be found.

Command	Command code (Hex)	Consecutive read	Description
Measure gas concentration	0x3639	Byte1: Gas concentration 8msb Byte2: Gas concentration 8lsb Byte3: CRC Byte4: Temperature 8msb Byte5: Temperature 8lsb Byte6: CRC Byte7: Reserved 8msb Byte8: Reserved 8lsb Byte9: CRC	The Gas concentration is a 16-bit unsigned integer. The temperature and byte 7 and 8 don't need to be read out. The read sequence can be aborted after any byte by a NACK and a STOP condition. The measurement command should not be triggered more often than once a second.

In case the 'Set temperature command' has been used prior to the measurement command, the temperature value given out by the STC31 will be that one of the 'Set temperature command'. When the 'Set temperature command' has not been used, the internal temperature value can be read out.
During product development it is recommended to compare the internal temperature value of the STC31 and the temperature value of the SHTxx, to check whether both sensors are properly thermally coupled. The values must be within 0.7°C.

3.3.7 Forced recalibration (FRC)

Forced recalibration is used to improve the sensor output with a known reference value. See the Field Calibration Guide for more details. If no argument is given, the sensor will assume a default value of 0 vol%. This command will trigger a concentration measurement as described in 3.3.6 and therefore it will take the same measurement time.

Command	Command code (Hex)	Argument	Description
Forced recalibration	0x3661	Reference concentration: 16bit unsigned integer	The sensor output is changed to correspond to the reference value given.

This command sequence needs to be closed off with a valid CRC byte for the 16-bit argument, if the CRC is not disabled.
When the CRC byte does not match the argument, the sensor will respond with a NACK and omit the forced recalibration. The concentration measurement is performed nonetheless.

3.3.8 Automatic self-calibration (ASC)

The sensor can run in automatic self-calibration mode. This mode will enhance the accuracy for applications where the target gas is not present for the majority of the time. See the Field Calibration Guide for more details. This feature can be enabled or disabled by using the commands as shown below. The default state is disabled.

Command	Command code (Hex)	Argument	Description
Enable automatic self-calibration	0x3FEF	NA	The sensor will apply automatic self-calibration
Disable automatic self-calibration	0x3F6E (default)	NA	The sensor will not apply automatic self-calibration. This is the default state of the sensor.

The automatic self-calibration is optimized for a gas concentration measurement interval of 1s. Substantially different measurement intervals may decrease the self-calibration performance.

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3.3.9 Automatic self-calibration in combination with sleep mode

Some additional steps are required to use forced recalibration or automatic self-calibration in combination with sleep mode. The sequence of these steps is:

1. Prepare read state
2. Read state
3. Enter sleep mode (see section 3.3.12)
4. Exit sleep mode (see section 3.3.12)
5. Write state
6. Apply state

Command	Command code (Hex)	Consecutive read	Description
Prepare read state	0x3752	NA	The sensor will prepare its current state to be read out
Read state	0xE133	30 bytes (10 times 16-bit word + CRC)	Read out the sensor state. The 30 bytes must be stored on the microcontroller to be written back to the sensor after exiting sleep mode

Command	Command code (Hex)	Argument	Description
Write state	0xE133	30 bytes (10 times 16-bit word + CRC)	Write the sensor state as read out earlier with the “Read state” (0xE133) command
Apply state	0x3650	NA	The sensor will apply the written state data

3.3.10 Self-test

The self-test command, runs an on-chip self-test which takes less than 20ms. It performs a full memory integrity check and checks that the operating voltage is within specifications.

Command	Command code (Hex)	Consecutive read	Description
Self-test	0x365B	Byte1: Self-test 8msb Byte2: Self-test 8lsb Byte3: CRC	The sensor will run an on-chip self-test. A successful self-test will return zero.

The 16-bit result of a sensor self-test is a combination of possible error states, encoded as bits (starting with lsb):

Bits	Error State
0-1	Memory error
2	VDD out of range
3-8	Measurement value error

In case of a successful self-test the sensor returns 0x0000 with correct CRC.

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3.3.11 Soft Reset

Command	I²C address + W bit + command code (Hex)	Consecutive read	Description
General call reset	0x0006	NA	This sequence resets the sensor with a separate reset block, which is as much as possible detached from the rest of the system on chip. Note that the I²C address is 0x00, which is the general call address, and that the command is 8 bit. The reset is implemented according to the I²C specification.

After the reset command the sensor will take maximum 12ms to reset. During this time the sensor will not acknowledge its address nor accept commands.

3.3.12 Entering and Exiting Sleep Mode

In sleep mode the sensor uses the minimum amount of current. The mode can only be entered from idle mode, i.e. when the sensor is not measuring. This mode is particularly useful for battery operated devices. To minimize the current in this mode, the complexity of the sleep mode circuit has been reduced as much as possible, which is mainly reflected by the way the sensor exits the sleep mode.

In sleep mode the sensor cannot be soft reset.

Command	Command code (Hex)	Consecutive read	Description
Enter Sleep mode	0x3677	NA	The sleep command can be sent after the result have been read out and the sensor is in idle mode.
Exit Sleep mode	NA	NA	The sensor exits the sleep mode and enters the idle mode when it receives the **valid I²C address and a write bit ('0').** Note that the I²C address is **not** acknowledged. It is possible to poll the sensor to see whether the sensor has received the address and has woken up. This takes maximum 12ms.

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3.3.13 Read Product Identifier

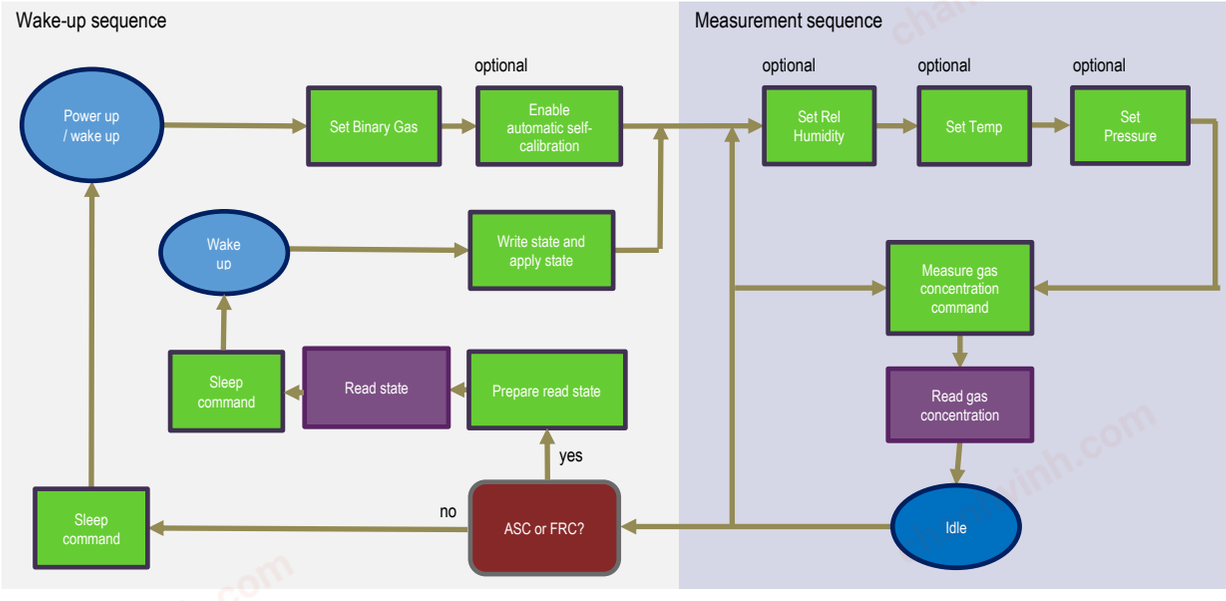
During assembly and start-up of the device it might be required to check some basic parameters in the sensor - for example to check if the correct sensor is integrated.
The product identifier and serial number can be read out after sending a sequence of two commands.

Command	Command code	Consecutive read	Description
Read product identifier	0x367C 0xE102	Byte1: Product number [31:24] Byte2: Product number [23:16] Byte3: CRC Byte4: Product number [15:8] Byte5: Product number [7:0] Byte6: CRC Byte7: Serial number [63:56] Byte8: Serial number [55:48] Byte9: CRC Byte10: Serial number [47:40] Byte11: Serial number [39:32] Byte12: CRC Byte13: Serial number [31:24] Byte14: Serial number [23:16] Byte15: CRC Byte16: Serial number [15:8] Byte17: Serial number [7:0] Byte18: CRC	Note that both commands need to be preceded with an I2C write header (I2C address + W). The second command returns: - 32-bit unique product and revision number. The number is listed in the table below. *Note that the last 8 bits are the revision number and can be subject to change.* - 64-bit unique serial number

Product	Product number
STC31	0x08010301

3.3.14 Recommended I²C Measurement Sequence

Overview of commands and modes



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3.4 Checksum Calculation

The checksum byte is generated by a CRC algorithm with the following properties:

Property	Value
Name	CRC-8
Protected data	read data
Width	8 bit
Polynomial	0x31 (x8 + x5 + x4 +1)
Initialization	0xFF
Reflect input	False
Reflect output	False
Final XOR	0x00
Example	CRC(0xBEEF) = 0x92

3.5 Conversion to Physical Values

3.5.1 Gas Concentration

The digital calibrated gas concentration signal read from the sensor is an unsigned integer number. The integer value can be converted to the physical value by the following conversion formula.

$$Concentration\ [vol\ \%\ in\ air] = \frac{STC3x\ output - 2^{14}}{2^{15}} \times 100$$

Example: 32000 => 47.7% volume concentration for the selected gas.

3.5.2 Temperature

The digital calibrated temperature signal read from or written to the sensor is a signed integer number (two's complement number). The integer value can be converted to the physical value by the following conversion formula.

$$Temperature\ [°C] = \frac{STC3x\ output\ or\ input}{200}$$

Example: 2500 => 12.5°C

3.5.3 Relative Humidity

The relative humidity value written to the sensor is an unsigned integer number. The integer value can be converted to the physical value by the following conversion formula.

$$Relative\ Humidity\ [\%] = \frac{STC3x\ input\ \times 100}{2^{16} - 1}$$

Example: 65535 => 100% relative humidity

3.5.4 Pressure

The pressure value written to the sensor is an unsigned integer number. The integer value can be converted to the physical value by the following conversion formula.

$$Pressure\ [mbar] = STC3x\ input$$

Example 1023 => 1023 mbar

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4. Physical specifications

4.1 Package outline

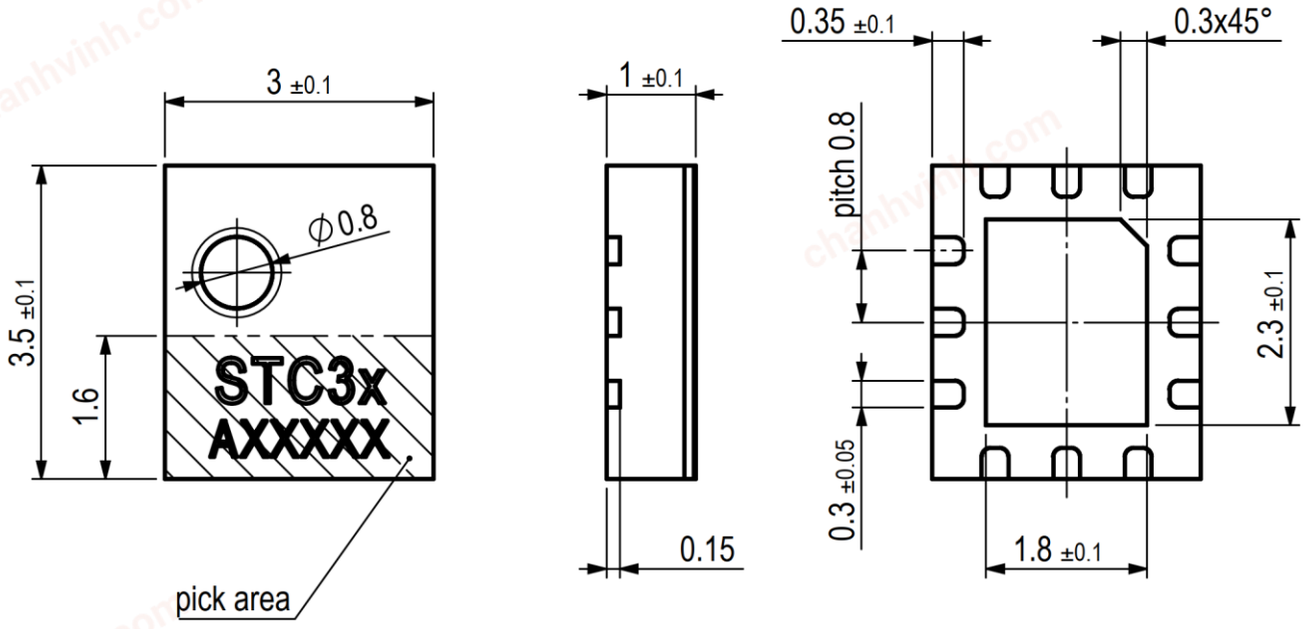


Figure 1 Dimensional drawing of STC3x including package tolerances (units mm)

4.2 Land pattern

The land pattern is recommended to be designed according to the used PCB and soldering process together with the physical outer dimension of the sensor.

4.3 Pin assignment

The pin assignments of the STC31 can be found in Table 1.

Pin no.	Name	Description
1	VSS	Connect to ground
2	-	Reserved. Do not connect
3	ADDR	I2C Address Selection
4	SCL	Serial Clock (I²C Interface)
5	VSS	Connect to ground
6	VDD	VDD Supply
7	SDA	Bidirectional Serial Data (I²C Interface)
8	-	Reserved. Do not connect
9	VSS	Connect to ground
10	-	Reserved. Do not connect
11	VSS	Connect to ground
12	-	Reserved. Do not connect

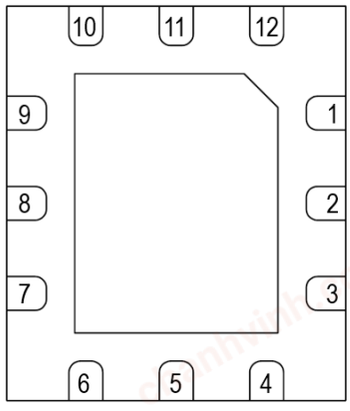


Table 1: *STC31 pin assignment (bottom view).*

4.3.1 Power Pins (VDD, GND)

The power supply pins must be decoupled with a 100 nF capacitor that shall be placed as close to the sensor as possible.

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4.3.2 Serial Clock and Serial Data (SCL, SDA)

The SCL and SDA are bidirectional pins of the I²C slave interface. The SCL is the Serial Clock pin and the SDA is the Serial Data pin. For more details about the I²C interface refer to section 3.

Both SCL and SDA lines are open-drain I/Os with diodes to VDD und VSS. They should be connected to external pull-up resistors (please refer to **Figure 2**). A device on the I2C bus must only drive a line to ground. The external pull-up resistors (e.g. R_p = 10 kΩ) are required to pull the signal high. For dimensioning resistor sizes please take bus capacity and communication frequency into account (see for example Section 7.1 of NXPs I2C Manual for more details[10]). It should be noted that pull-up resistors may be included in I/O circuits of microcontrollers. It is recommended to wire the sensor according to the application circuit as shown in **Figure 2**.

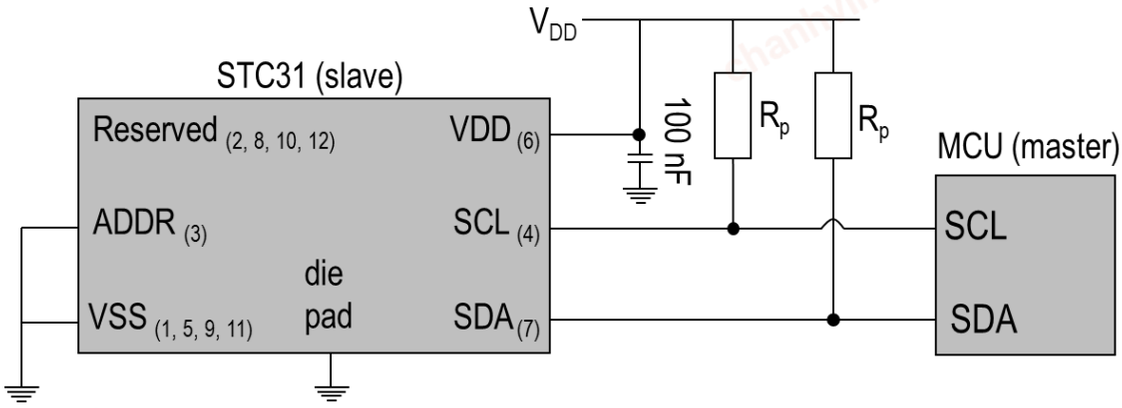


Figure 2: *Typical application circuit. Please note that the positioning of the pins does not reflect the position on the real sensor. This is shown in Table 1. The pin numbers corresponding to the schematic in Table 1 are indicated.*

4.3.3 Address Selection Pin (ADDR)

A resistor between ADDR and VDD may be used to configure the I2C address the STC31 uses for communication. Table 2 shows the selectable addresses and their respective conditions.

I2C Address in Hex. representation	Condition
0x29 (default)	Ground or no connection between ADDR (pin 3) and VDD (pin 6)
0x2A	10 kOhm between ADDR (pin 3) and VDD (pin 6)
0x2B	3.3 kOhm between ADDR (pin 3) and VDD (pin 6)
0x2C	1 kOhm between ADDR (pin 3) and VDD (pin 6)

Table 2: *STC31 I2C addresses*

4.3.4 Die Pad (Center Pad)

The die pad or center pad is visible from below and located in the center of the package. It is internally connected to GND and therefore, there are no electrical constraints on connecting or not connecting the die pad to GND.

[10] http://www.nxp.com/documents/user_manual/UM10204.pdf

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5. Sensor Integration

5.1 Compensation of Humidity and Temperature

Both the temperature and the absolute humidity influence the thermal conductivity. The temperature is compensated by the STC31 sensor automatically.

The STC31 has the option to compensate for the humidity. The relative humidity has to be communicated to the STC31, and with this information the sensor will output a compensated concentration value. When no humidity value is given to the STC31, the sensor assumes a relative humidity of 0%.

To measure the relative humidity **Sensirion's SHTC3 humidity sensor** is recommended. When using the SHTC3, it is also recommended to feed the temperature of the SHTC3 to the STC31, because the SHTC3 has a higher temperature accuracy.

Sections 3.3.3 and 3.3.4 describe how the humidity and temperature values can be written to the STC31.

In most of the cases pressure changes related to weather can be neglected. However, it is recommended to compensate pressure deviations from 1013mbar as shown in section 3.3.5.

Important note: It is very important that the humidity sensor measures the humidity and temperature of the gas surrounding the STC31 sensor. The humidity sensor must be placed as close as possible to the STC31 sensor. Airflows might result in temperature differences, which will result in inaccurate values used for compensation. Additionally, thermal coupling precautions as mentioned in section 5.2 become even more relevant when using both sensors.

5.2 Thermal Coupling

The STC31 uses a thermal principle to measure gas concentrations. This implies that the sensor is sensitive to external heat sources or self-heating. Consider the following:

- Reduce I^2C communication with the sensor to a minimum
- Increase the time between measurements as much as possible. At least one second must be between measurements.
- Prefer a high resistance pull-up resistor to a low resistance pull-up resistor.
- Thermally decouple the I^2C bus from the MCU if the MCU can get hot and the I2C bus is short.
- Prevent sources emitting infrared to the sensor element.
- Keep the sensor away from other components that somehow can transfer heat to the sensor, e.g. power converters, motors, etc.

5.3 Gas Flows

Gas flows might affect the thermal balance between the STC31, SHTC3 and the PCB, which could influence the accuracy of the gas concentration measurements. If the gas concentration needs to be measured in a flow, it is advised to create some kind of dead space that is well vented, but keeps the sensor(s) out of the direct flow of the gas.

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6. Shipping Package

STC31 is provided in tape & reel shipment packaging. Standard packaging size is 400 or 5000 units per reel.

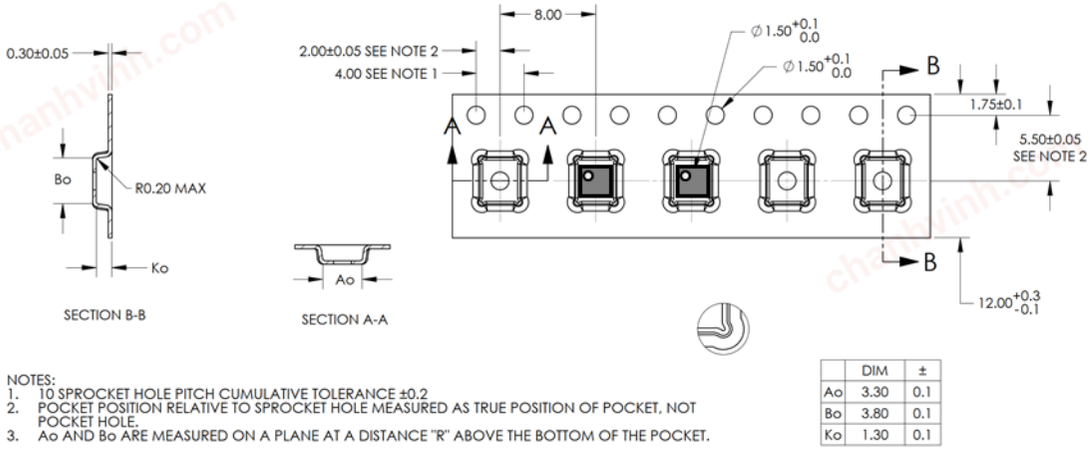


Figure 3 Technical drawing of the packaging tape with sensor orientation in tape. Header tape is to the right and trailer tape to the left on this drawing. Dimensions are given in millimeters.

7. Ordering Information

Use the part names and product numbers shown in the following table when ordering STC31 Thermal Conductivity Sensor. For the latest product information and local distributors, visit www.sensirion.com.

Part name	Description / Output	Order number	Packaging	Tape & Reel size
STC31-R3	I²C	3.000.331	Tape & Reel	400
STC31-R5		3.000.160	Tape & Reel	5000

Revision History

Date	Author	Version	Changes
03.09.2020	JGOE	V1.0	Initial Release

chanhvinh.com

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 (including death). 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 datasheet 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 "Handling Instructions" 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 datasheet 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.

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