**Advanced Information Datasheet**
18.03.2014

**Revision 1.25**

# HDC1000 Low power humidity and temperature Digital Sensors

## FEATURES

- **Relative Humidity Range** **0% to 100%**
- **Resolution** **14 bits**
- **Humidity Accuracy** **±2%**
- **Supply Current (Measuring)** **300uA**
- **Avg Supply Current (1sps, hum only)** **1.2uA**
- **Avg Supply Current (1sps, hum+temp)** **2.8uA**
- **Temperature Range:**
  - **Operating:** **-20°C to +85°C**
  - **Functional:** **-40°C to +125°C**
- **Temperature accuracy** **±0.5°C**
- **Supply voltage** **3V to 5V**
- **I²C Interface**

## APPLICATIONS

- **HVAC**
- **White goods**
- **Printers**
- **Handheld Meters**
- **Automotive Windshield Defog**
- **Smart Thermostats and Room Monitors**
- **Medical Devices**
- **Cargo Shipping**

## PACKAGE

- WCSP 8-bump (HDC1000) 2.1mm x 1.65mm

## DESCRIPTION

The HDC1000 is an integrated humidity and temperature sensor that provides excellent measurement accuracy at very low power. The device uses a capacitive based humidity sensor and a novel capacitance-to-digital converter architecture.

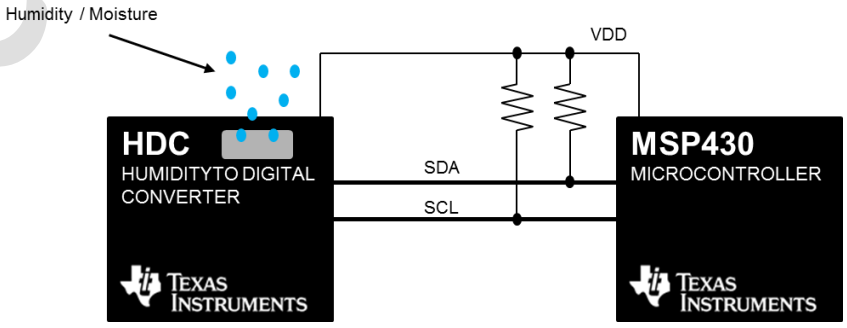
When measuring both humidity and temperature together, the supply current is 2.8uA (average, 1 measurement per second). This low power consumption enables applications to perform continuous temperature compensation of humidity readings.

The fast response time enables applications in automotive where humidity conditions may change rapidly.

Measurement data are in a 14-bit format for both humidity and temperature and are available through the I²C interface

The HDC1000 is factory calibrated and ±2% humidity accuracy is maintained within the -10°C to +70°C temperature range. The device is functional within the full -40°C to +125°C temperature range.

## TYPICAL APPLICATION



## ABSOLUTE MAXIMUM RATINGS(1)

| | |
|---|---|
| Supply Voltage | 6 V |
| Operating Temperature | -20 to 85°C |
| Storage Temperature | 150°C |
| Junction Temperature | +175°C |
| ESD Rating, HBM | 2kV |
| | |
| | |

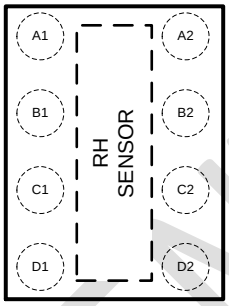
NOTE: (1) Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

## ELECTROSTATIC DISCHARGE SENSITIVITY

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## PIN CONFIGURATION




Top view
WCSP-8

| Pin (µSMD-8) | Name | Comment |
|---|---|---|
| A1 | SCL | Serial clock line for I2C, open-drain; requires a pull-up resistor to VDD |
| B1 | VDD | Positive Supply Voltage |
| C1 | ADR0 | Address select pin |
| D1 | ADR1 | Address select pin |
| A2 | SDA | Serial data line for I2C, open-drain; requires a pull-up resistor to VDD |
| B2 | GND | Ground |
| C2 | NC | Not connected |
| D2 | DRDYn | Data ready, active low, open-drain; requires a pull-up resistor to VDD |

# ELECTRICAL CHARACTERISTICS

At $T_A$=+30°C, $V_{DD}$ = 3V, 20% <= RH <= 80%unless otherwise noted.
**Boldface limits apply over the specified temperature range, $T_A$ = -20°C to +85°C.**

| Parameter | Symbol | Conditions | MIN | TYP | MAX | Unit |
|---|---|---|---|---|---|---|
| **Relative Humidity (RH)** | | | | | | |
| Accuracy | $RH_{ACC}$ | | | ±2 | | %RH |
| Repeatability | $RH_{REP}$ | | | ±0.1 | | %RH |
| Hysteresis | $RH_{HYS}$ | | | ±1 | | %RH |
| Response Time | $RH_{RT}$ | T 63% step | | tbd | | sec |
| Conversion Time | $RH_{CT}$ | 7 bit accuracy | | 3.3 | | ms |
| | | 11 bit accuracy | | 4.5 | | ms |
| | | 14 bit accuracy | | 7.1 | | ms |
| Operating range | $RH_{HOR}$ | *Note 1*, non condensing | 0 | | 100 | %RH |
| Temperature operating range | $RH_{TOR}$ | 0%RH to 80%RH | -10 | | 70 | °C |
| Extended Operating range | $RH_{EOR}$ | *Note 2*, 0%RH to 80%RH | -20 | | 85 | °C |
| Long term drift | $RH_{LTD}$ | Non condensing | | 0.5 | | %RH/yr |
| **Temperature** | | | | | | |
| Accuracy | $TEMP_{ACC}$ | 5degC to 60degC | | ±0.2 | ±0.5 | °C |
| Repeatability | $TEMP_{REP}$ | | | ±0.1 | | °C |
| Conversion Time | $TEMP_{CT}$ | 11 bit accuracy | | 4.0 | | ms |
| | | 14 bit accuracy | | 6.5 | | ms |
| Response Time | $TEMP_{RT}$ | *Note 3*, T 63% step | | tbd | | sec |
| Extended Operating range | $TEMP_{EOR}$ | | -20 | | 85 | °C |
| Response Time | $TEMP_{RT}$ | T 63% step | | 20 | | sec |
| Long Term Drift | $TEMP_{LTD}$ | | | 0.04 | | °C/yr |
| **Power Supply** | | | | | | |
| Supply Voltage | VDD | Operating range | 2.7 | 3.0 | 5.5 | V |
| Supply current | IDD | *Note 4,* RH measurement | | | 300 | µA |
| | | *Note 4,* Temp measurement | | | 300 | µA |
| | | Sleep | | | 0.4 | µA |
| | | *Note 3,* Average @ 1 measurement/second, RH or Temp only (11 bit) | | | 1.2 | µA |
| | | *Note 4,* Average @ 1 measurement/second, RH only (11bit) +temperature (11 bit) | | | 2.8 | µA |
| | | Startup (average on Start-up time) | | 300 | tbd | µA |
| Heater | $IDD_{HEAT}$ | Delta T tbd | | 6.6 | | mA |
| **Digital Interface ($I^2C$ Detail TDB)** | | | | | | |
| Input High Voltage | $V_{IH}$ | | **0.7*VDD** | | | V |
| Input Low Voltage | $V_{IL}$ | | | | **0.3*VDD** | V |
| Output Low Voltage | $V_{OL}$ | Sink current 3mA | | | **0.4** | V |
| Hysteresis | HYS | | **0.1*VDD** | | | V |
| Input Capacitance on all digital pins | $C_{IN}$ | | | 0.5 | | pF |
| Clock Frequency | $f_{SCL}$ | | **10** | | **400** | kHz |
| Clock Low Time | $t_{LOW}$ | | **1.3** | | | µs |
| Clock High Time | $t_{HIGH}$ | | **0.6** | | | µs |
| Data valid | $t_{HD;STA}$ | | | | **400** | ns |
| Start-up time | $t_{START}$ | | | 10 | tbd | ms |
| Pulse Width of spike suppressed | $t_{SP}$ | Note5 | | | 50 | ns |

*Note 1*, Recommended humidity operating range is 20 to 80% RH (non-condensing) over 0 to 60 °C. Prolonged operation beyond these ranges may result in a shift of sensor reading, with slow recovery time.
*Note 2*, Operation in these ranges may result in a shift of sensor reading, with slow recovery time.
*Note 3*, Actual response times will vary dependent on system thermal mass and air-flow.
*Note 4*, I2C read/write communication and pull-up resistors current through SCL, SDA not included.
*Note 5* This parameter is specified by design and/or characterization and is not tested in production.

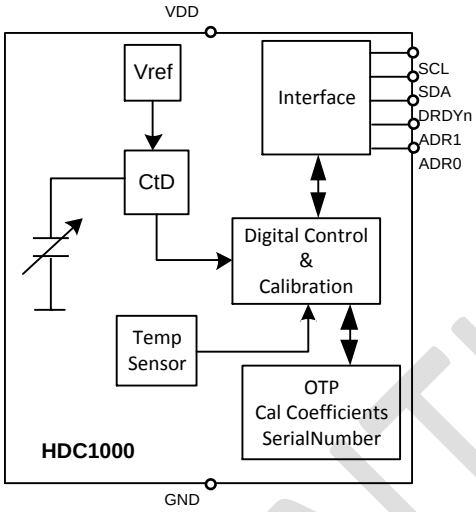
## Typical Curve List

- %RH error vs. temperature @ VDD=3V (from -20°C to 85°C, step 5°C, except 0°C)
- %RH error vs. %RH, @VDD=3V, Temp=25°C (from 2.5%RH to 97.5%RH, step 5%RH)
- Temperature error vs. Temperature, VDD=3V (from -20°C to 85°C, step 5°C)
- Supply current vs. Temperature, VDD=2.7V,3V,3.3V,5V (from -20°C to 85°C, step 5°C)
    - Temp measurement
    - RH measurement
    - Sleep mode
- Supply current vs. supply voltage, T=-20°C, T=25°C, T=40°C, T=85°C (from VDD=2.7V to 5.5V, step 280mV)
    - Temp measurement
    - RH measurement
    - Sleep mode
- Startup current vs. time (startup time), VDD=2.7V, VDD=3V, VDD=3.3V, VDD=5V (Temp 25°C, 85°C)
- Table %RH accuracy vs. temperature and %RH, VDD=3V
    - Temp step 5°C
    - RH step 5%RH
    - N 30 samples (minimum)

# Applications Information

**General Info**

The HDC1000 is a fully integrated humidity plus temperature sensor, providing excellent measurement accuracy and long term stability. It is based on capacitive humidity sensor and novel Capacity to Digital (CtD) architecture. Measurement results can be read out through the I2C compatible interface. Resolution is 7, 11 and 14 bit for humidity, 11 and 14 bit for temperature.




**Power consumption**

One of the key features of the HDC1000 is its low power consumption. It makes the device suitable in battery or power harvesting applications. In these applications the HDC1000 spends most of the time in sleep mode; it means that with its less than 0.5uA of current consumption the averaged current consumption is minimal.

**Additional feature**

- Diagnostic Heater
- VDD monitoring (battery monitoring)

**Soldering**

For soldering HDC1000, standard reflow soldering ovens may be used. The sensor is qualified to withstand soldering profile according to IPC/JEDEC J-STD-020 with peak temperatures at 260EDEC J-STD-020 with peakthPb-free assembly in IR/Convection reflow ovens. Use no clean flux.
After soldering, the devices should be stored at humidity of 75%RH and temperature at 30°C for at least 18h to allow the sensor element to re-hydrate. Otherwise the sensor may read an offset that slowly disappears if exposed to ambient conditions. Alternatively the re-hydration process may be performed at ambient conditions (>40%RH) during more than 5 days.

**Recovery from soldering**

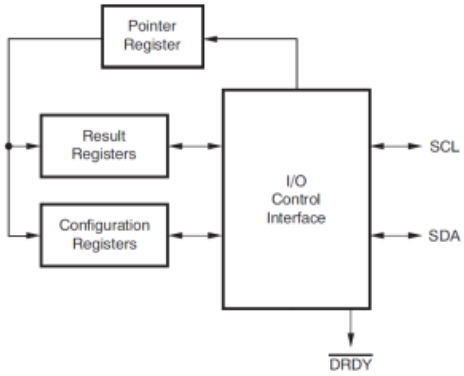
The HDC1000 needs to gently recover from soldering at 105°C with 0% RH for 12hours.

**Recovery from condensing**

The HDC1000 needs to gently recover from condensing atmosphere situations. At condensing atmosphere reduced accuracy is acceptable

The HDC1000 initially starts up with typical settings consisting of 14 bit adc resolution for both the humidity and the temperature.

The internal structure of the digital interface (HDC1000) is shown in the figure below.




**SERIAL BUS ADDRESS**

To communicate with the HDC1000, the master must first address slave devices via a slave address byte. The slave address byte consists of seven address bits and a direction bit that indicates the intent to execute a read or write operation.

The HDC1000 features two address pins to allow up to 4 devices to be addressed on a single bus. The table below describes the pin logic levels used to properly connect up to 4 devices. The state of the ADR0 and ADR1 pins is sampled on every bus communication and should be set before any activity on the interface occurs. The address pin is read at the start of each communication event.

| ADR1 | ADR0 | HDC1000 ADDRESS |
|---|---|---|
| 0 | 0 | 1000000 |
| 0 | 1 | 1000001 |
| 1 | 0 | 1000010 |
| 1 | 1 | 1000011 |

**INTERNAL REGISTERS**

The HDC1000 contains data registers that hold configuration information, temperature and humidity measurement results, and status information.

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **00h** | Temperature | **T13** | **T12** | **T11** | **T10** | **T9** | **T8** | **T7** | **T6** | **T5** | **T4** | **T3** | **T2** | **T1** | **T0** | **0** | **0** |
| **01h** | Humidity | **H13** | **H12** | **H11** | **H10** | **H9** | **H8** | **H7** | **H6** | **H5** | **H4** | **H3** | **H2** | **H1** | **H0** | **0** | **0** |
| **02h** | Configuration | RST | 0 | ENHT | MODE | **BTST** | TRES | RHRES | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **FBh** | Serial ID [40:25] | **SN40** | **SN39** | **SN38** | **SN37** | **SN36** | **SN35** | **SN34** | **SN33** | **SN32** | **SN31** | **SN30** | **SN29** | **SN28** | **SN27** | **SN26** | **SN25** |
| **FCh** | Serial ID [24:9] | **SN24** | **SN23** | **SN22** | **SN21** | **SN20** | **SN19** | **SN18** | **SN17** | **SN16** | **SN15** | **SN14** | **SN13** | **SN12** | **SN11** | **SN10** | **SN9** |
| **FDh** | Serial ID [8:0] | **SN8** | **SN7** | **SN6** | **SN5** | **SN4** | **SN3** | **SN2** | **SN1** | **SN0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **FEh** | Manufacturer ID | **ID15** | **ID14** | **ID13** | **ID12** | **ID11** | **ID10** | **ID9** | **ID8** | **ID7** | **ID6** | **ID5** | **ID4** | **ID3** | **ID2** | **ID1** | **ID0** |
| **FFh** | Device ID | **ID15** | **ID14** | **ID13** | **ID12** | **ID11** | **ID10** | **ID9** | **ID8** | **ID7** | **ID6** | **ID5** | **ID4** | **ID3** | **ID2** | **ID1** | **ID0** |

Registers in **bold** are read-only.
Register from 03h to FAh are reserved

**POINTER REGISTER**

The HDC1000 has an 8-bit pointer used to address a given data register, as shown in the table below.

| **Register** | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 |
|---|---|---|---|---|---|---|---|---|
| **Reset_value** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

The pointer identifies which of the data registers should respond to a read or write command on the two-wire bus. This register is set with every write command. A write command must be issued to set the proper value in the pointer before executing a read command. The power-on reset (POR) value of the pointer is 00h; this value selects the temperature measurement.

**Temperature register**

The temperature register is a 16-bit result register in binary format (2 last bits D1 and D0 always 0). The result of the acquisition is always a 14 bit value, while the accuracy is related to the selected conversion time (refer to the EC table). The equation for the temperature is

$$Temperature\ (°C) = \left[\frac{D15{:}D0}{2^{16}}\right] * 165°C - 40°C$$

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00h | Temperature | T13 | T12 | T11 | T10 | T9 | T8 | T7 | T6 | T5 | T4 | T3 | T2 | T1 | T0 | 0 | 0 |
| | Reset value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Humidity register**

The humidity register is a 16-bit result register in binary format (2 last bits D1 and D0 always 0). The result of the acquisition is always a 14 bit value, while the accuracy is related to the selected conversion time (refer to the EC table). The equation for the humidity is

$$Relative\ Humidity\ (\%RH) = \left[\frac{D15{:}D0}{2^{16}}\right] * 100\%RH$$

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01h | Humidity | H13 | H12 | H11 | H10 | H9 | H8 | H7 | H6 | H5 | H4 | H3 | H2 | H1 | H0 | 0 | 0 |
| | Reset value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Configuration register**

The table below describes the Configuration Register. This register determines the ADC resolution for humidity and temperature measurement, enables the heater, gives the battery status, performs a software reset, or puts the device into shutdown mode.
This register is read/write, and the pointer address is 02h.

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 02h | Configuration | RST | 0 | ENHT | MODE | **BTST** | TRES | RHRES | | | | | | | | | |
| | Reset value | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Bit [15] RST: Software reset bit
0 = Normal operation, this bit self clears
1 = Software reset

Bit [13] ENHT: Enable Heater
0 = Heater disables
1 = Heater enabled

Bit [12] MODE: Select acquisition mode
0 = Temperature and Humidity are acquired separately. The results of the acquisition is available in the 00h and 01h registers
1 = Temperature and Humidity are acquired in sequence, Temperature first. The results of the acquisition is available in the 00h and 01h registers

Bit [11] BTST: Battery status (read only) this register contains the status of the battery after the latest Humidity/temp measurement.
0 = Battery voltage > 2.8V
1 = Battery voltage < 2.8V

Bit [10] Temperature – ADC resolution
0 =High resolution: 14 bit

1= Low resolution: 11 bit

Bit [9:8] RH – ADC resolution
00 =High resolution: 14 bit
01= Mid resolution: 11 bit
10= Low resolution: 7 bit

**SERIAL NUMBER REGISTERS**

These registers contain a unique serial number which identifies each HDC1000.

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FBh | Serial ID [40:25] | SN40 | SN39 | SN38 | SN37 | SN36 | SN35 | SN34 | SN33 | SN32 | SN31 | SN30 | SN29 | SN28 | SN27 | SN26 | SN25 |
| | Reset value | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| FCh | Serial ID [24:9] | SN24 | SN23 | SN22 | SN21 | SN20 | SN19 | SN18 | SN17 | SN16 | SN15 | SN14 | SN13 | SN12 | SN11 | SN10 | SN9 |
| | Reset value | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| FDh | Serial ID [8:0] | SN8 | SN7 | SN6 | SN5 | SN4 | SN3 | SN2 | SN1 | SN0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Reset value | x | x | x | x | x | x | x | x | x | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**MANUFACTURER ID REGISTER**

This register contains a factory-programmable identification value that identifies this device as being manufactured by Texas Instruments. This register distinguishes this device from other devices that are on the same I2C bus. The contents of this register are 5449h, or TI in Ascii. The manufacturer ID reads 5449h The table below summarizes these values.

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FEh | Manufacturer ID | ID15 | ID14 | ID13 | ID12 | ID11 | ID10 | ID9 | ID8 | ID7 | ID6 | ID5 | ID4 | ID3 | ID2 | ID1 | ID0 |
| | Reset value | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |

**DEVICE ID REGISTER**

This register contains a factory-programmable identification value that identifies this device as a HDC1000. This register distinguishes this device from other devices that are on the same I2C bus. The Device ID for the HDC1000 is 1000h.

| POINTER | REGISTER | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FFh | Device ID | ID15 | ID14 | ID13 | ID12 | ID11 | ID10 | ID9 | ID8 | ID7 | ID6 | ID5 | ID4 | ID3 | ID2 | ID1 | ID0 |
| | Reset value | x | x | x | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**SERIAL INTERFACE**

The HDC1000 operates only as a slave device on the two-wire bus interface. It is not allowed having on the 2-wire bus multiple devices with the same address.
Connection to the bus is made via the open-drain I/O lines, SDA, and SCL. The SDA and SCL pins feature integrated spike-suppression filters and Schmitt triggers to minimize the effects of input spikes and bus noise.
After power-up, the sensor needs at most 10 ms, to be ready to start RH and temperature measurement. It is just able to provide the content of the serial number registers (FBh to FFh) if requested. After the power-up the sensor is in the sleep mode until a communication or measurement is performed.
The HDC1000 supports the transmission protocol for fast mode (10 kHz to 400 kHz).
All data bytes are transmitted MSB first.

**SERIAL BUS ADDRESS**

To communicate with the HDC1000, the master must first address slave devices via a slave address byte. The slave address byte consists of seven address bits, and a direction bit that indicates the intent to execute a read or write operation.

**READ/WRITE OPERATIONS**

Access a particular register on the HDC1000 by writing the appropriate value to the Pointer Register. The pointer value is the first byte transferred after the slave address byte with the R/W bit low. Every write operation to the HDC1000 requires a value for the pointer register. When reading from the HDC1000, the last value stored in the pointer by a write operation is used to determine which register is read by a read operation. To change the pointer register for a read operation, a new value must be written to the pointer. This transaction is accomplished by issuing the slave address byte with the R/W bit low, followed by the pointer byte. No additional data are required. The master can then generate a START condition and send the slave address byte with the R/W bit high to initiate the read command. Note that register bytes are sent MSB first, followed by the LSB.

A write operation in a read only registers such as (DEVICE ID, MANUFACTURER ID, SERIAL ID) returns a NACK after each data byte; read/write operation to unused address returns a NACK after the pointer; a read/write operation with incorrect I2C address returns a NACK after the I2C address.

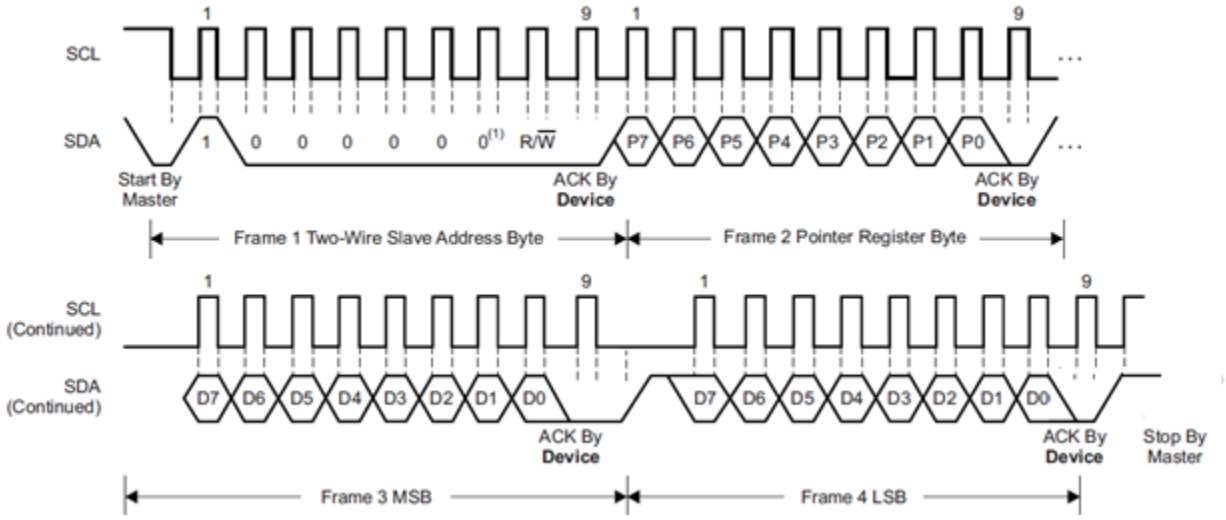
**MEASUREMENT OF HUMIDITY AND/OR TEMPERATURE**

In order to perform temperature and/or humidity measurements separately (Bit[11]=0 of configuration register) the pointer must be written to with the address 00h or 01h. As soon as the data are available the DRDYn pin is set LOW. A reading operation of the temperature and/or humidity registers gives the latest acquired value. After the selected acquisition the HDC1000 goes in sleep mode.
A reading operation of the temperature or humidity register will get back a NACK if the content of the register has not been updated and DRDYn high (HDC1000 case). Since the HDC1000 doesn't reset the pointer a successive reading operation after a NACK can be performed just writing the slave address and the direction bit.
If temperature and humidity measurements are both requested (Bit[11]=1 of configuration register) the pointer must be written to with the address 00h, a read operation which points to the temperature register will send back 4 bytes (temperature MSB byte, temperature LSB byte, humidity MSB byte, humidity LSB byte). In order to save power the master can stop the reading operation after the 3$^{rd}$ byte by issuing a NACK. By default the HDC1000 perform temperature and humidity measurement in sequence (Bit[11]=1). If the pointer is already pointing to address h00 for example, it needs to be update again to address 00h to initiate a new measurement. The pointer write transaction initiates measurements.

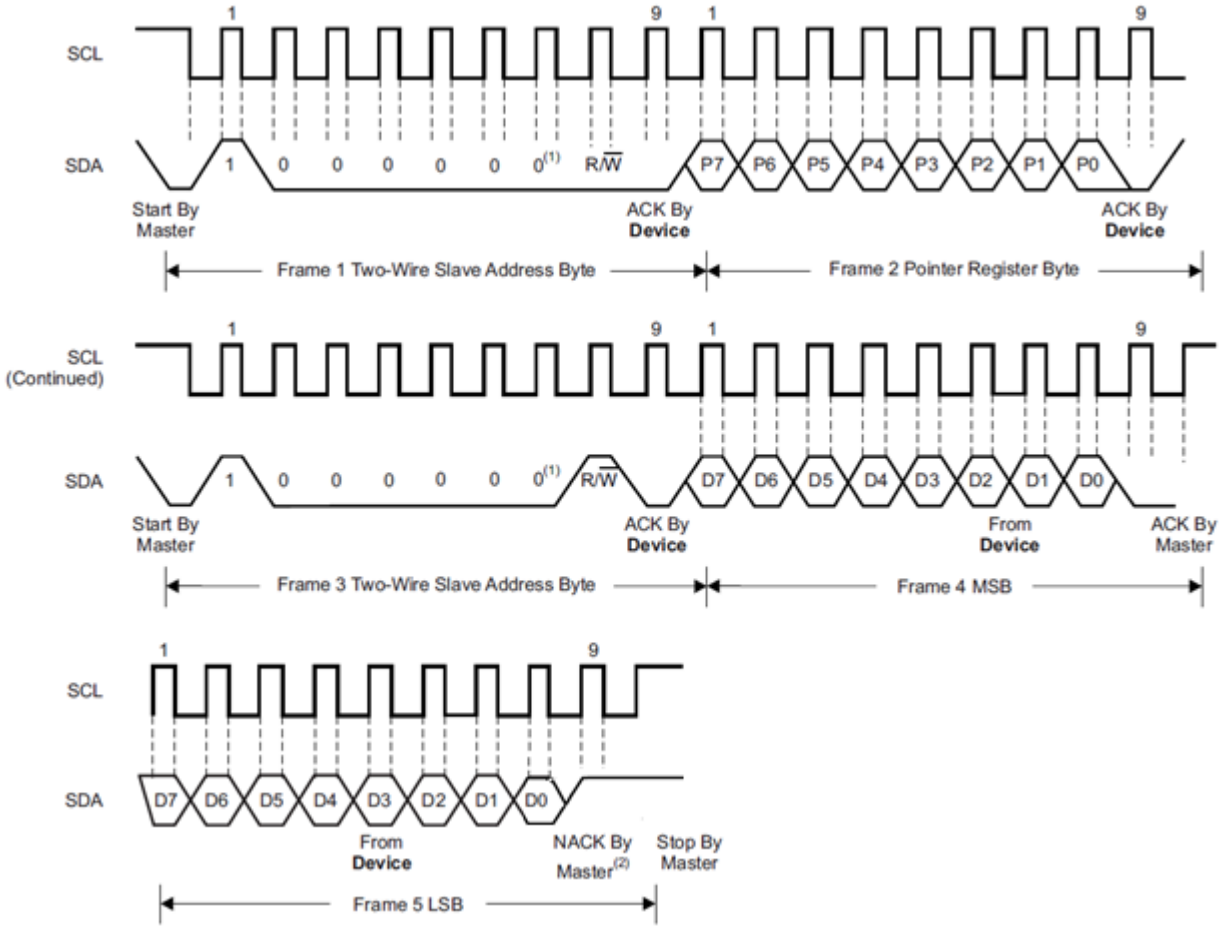
It is possible to read 0h00 and 0h01 registers during a Temperature or Relative Humidity measurement without affecting the on-going measurement. Only a write to the pointer will abort the on-going measurement.

**TIMING**

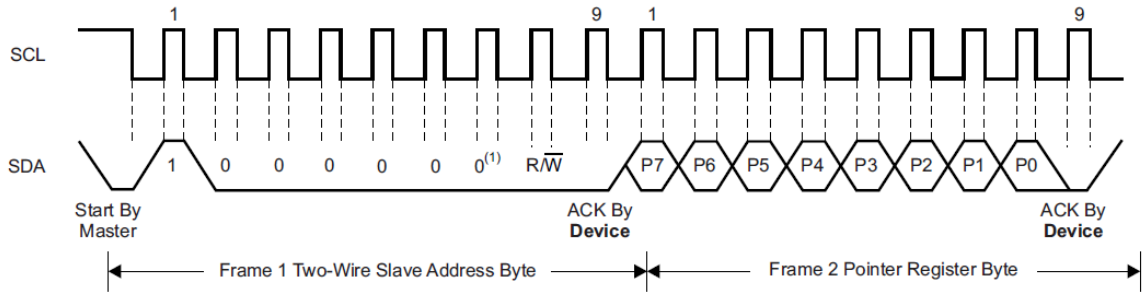
**Write frame (configuration register)**



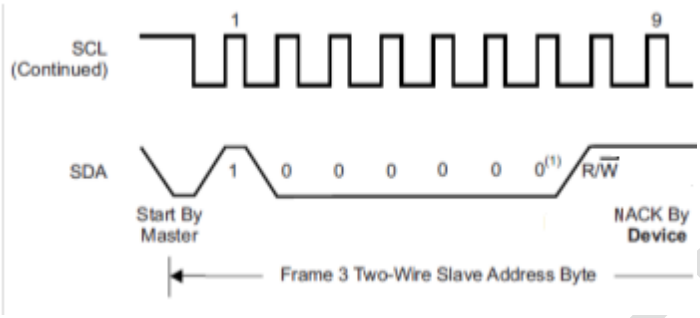

**Read frame (Configuration register)**



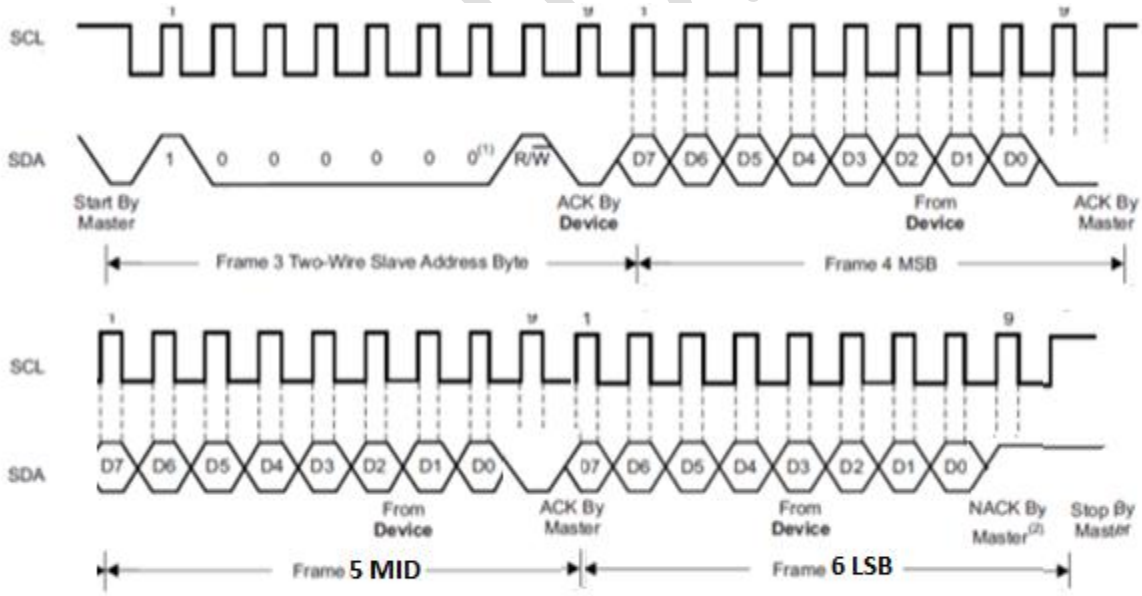
**Trigger Humidity/Temperature measurement**




**Read Humidity/Temperature measurement (data not ready)**




**Read capacitance measurement (data ready)**

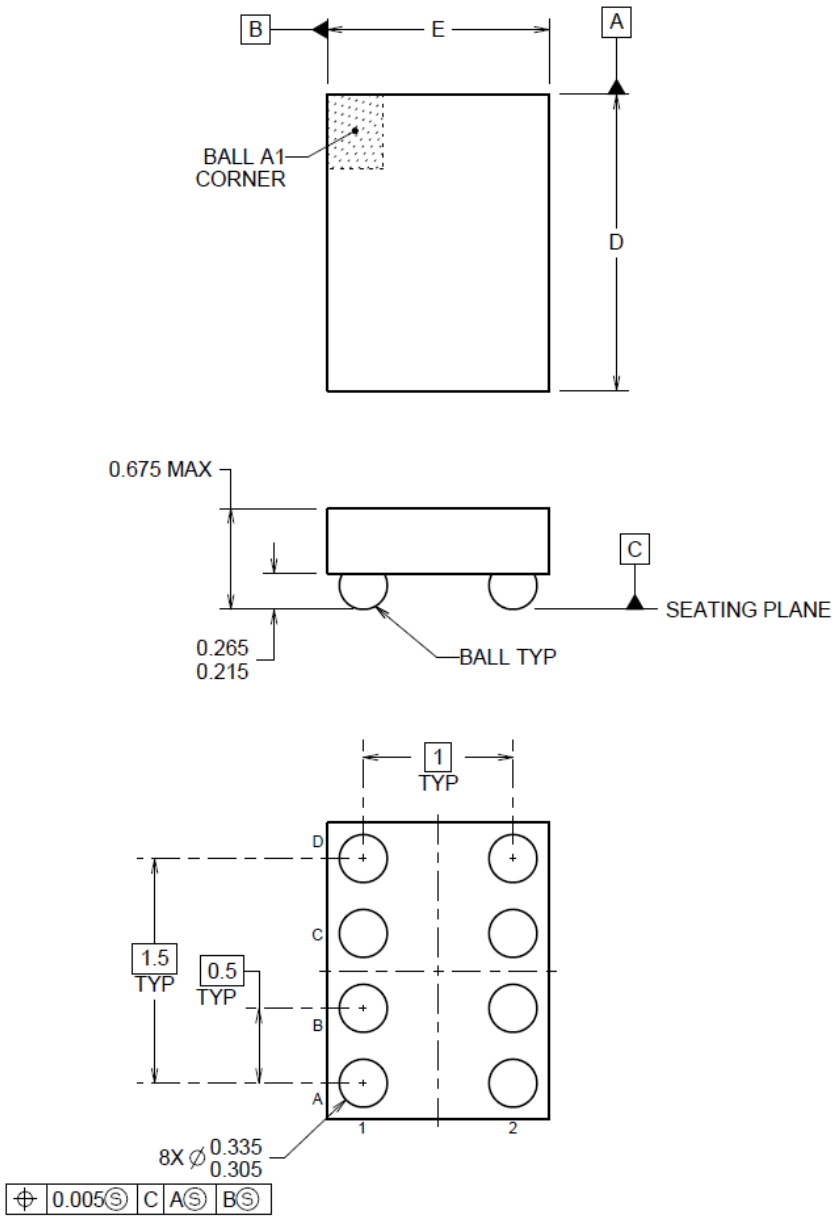


## MECHANICAL DATA

YPA0008

DSBGA - 0.675 mm max height

DIE SIZE BALL GRID ARRAY




4215068/A 11/2013

NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

A = 2.040mm
B = 1.590mm