HCP2D-3V

Advanced Humidity & Temperature Solution

Enhanced Features

- Improved Temperature Accuracy & Range
  (±0.2℃ for -20 ~ 60℃)
- Extremely Low Current Consumption
  (13㎂ operating)
- I^2C with Alarm Function
- Enhanced Accuracy of RH% (±2%RH, 14bit)
- Pin-to-Pin match with existing HumiChip®
- Fast Natural Recovery after Reflow Soldering
- Enhanced Reliability against Chemical

Product Summary

HCP2D-3V is an improved version of **HumiChip®**, the most advanced and cost effective humidity and temperature sensing solution for virtually any type of applications.

Capacitive polymer sensor chip developed and fabricated in-house and CMOS integrated circuit with EEPROM are integrated into one embedded system in a reflow solder-able SMD package.

Individually calibrated and tested, **HCP2D-3V** performs ±2% from 20% to 80%RH (±4% over entire humidity range), and yet, is simple and ready to use without further calibration or temperature compensation.

HCP2D-3V provides linear output signals in various interfaces to customer requirements - the **standard I²C interface** and an **Alarm function** for preset control at min/max humidity.

Designed and manufactured by industry leading humidity and temperature sensing technology of **SAMYOUNG S&C** – field proven in HVAC and Auto industry for over 15 years, **HCP2D-3V** offers another smart sensing solution for excellent reliability, high accuracy, and cost effective sensing applications.

Application

Energy Saving HVAC Control

Air Conditioning, Refrigeration, IAQ monitoring, Vent Fans, Home Appliances, Humi/Dehumidifiers

Process Control & Instrumentations

Medical Instruments, Handheld Devices, Weather Stations, Food Processing, Printers, RFIDs …

Automobile & Transportation

Cabin Climate Control, Defogging Control Condensing Preventive Device …,

Mass Quantity Application

OEM custom specification available

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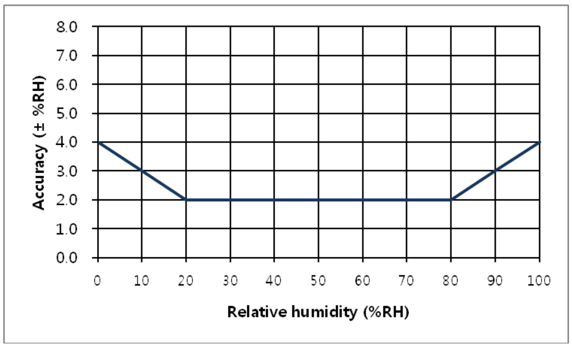
Sensor Performance

Relative Humidity (%RH)

* Custom Accuracy Tolerance Available

Resolution	**14 bit** (0.01%RH)
Accuracy[1]	**±2.0** %RH (**Figure 1**)*
Repeatability	**±0.2** %RH
Hysteresis	**±1.5** %RH
Linearity	**<2.0** %RH
Response time[2]	**Max 8.0** sec (τ 63%)
Operating range	**0 ~ 100** %RH (Non-Condensing)
Long term drift	**<0.5** %RH/yr (Normal condition)

1. Accuracies measured at 25℃, 3.3V.
2. Measured at 25℃, 1m/sec airflow for achieving 63% of step from 10%RH to 90%RH

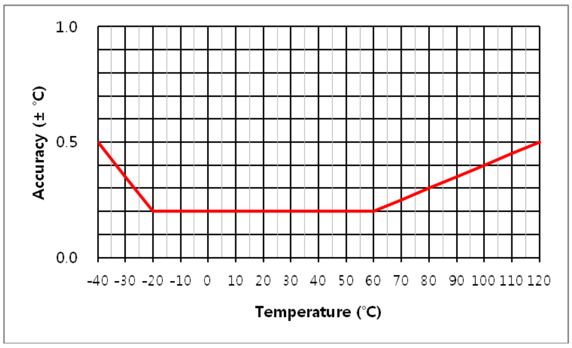


Typical %RH Accuracy at 25℃

Temperature (°C)

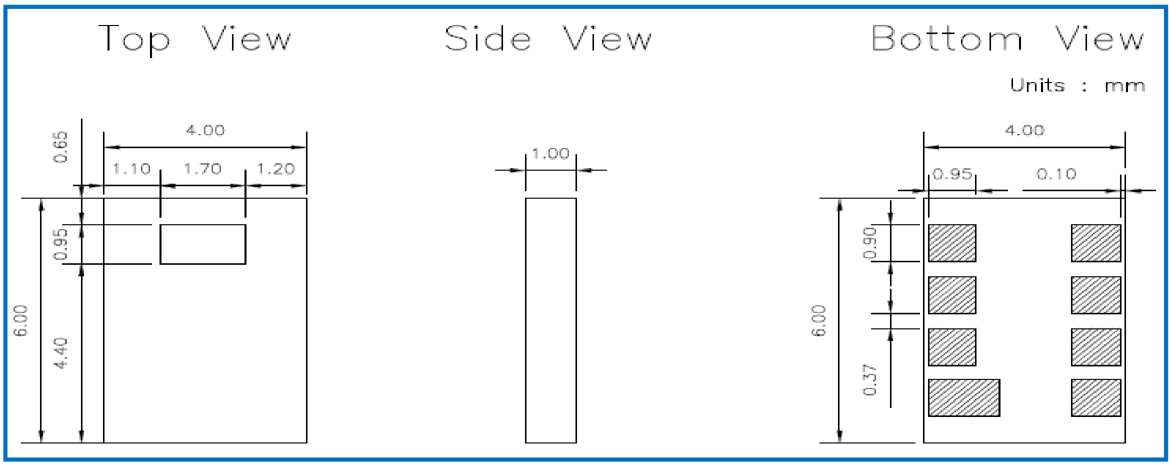
Resolution	**14 bit** (0.01℃)
Accuracy[3]	**±0.2** ℃ (**Figure 2**)
Repeatability	**±0.1** ℃
Response time[4]	**10.0** sec (τ 63%)
Operating range	**- 40 ~ 125** ℃
Long term drift	**<0.05** ℃/yr (Normal condition)

3. Accuracies measured at 25℃, 3.3V.
4. Min 5.0 sec, Max 20 sec



Typical Temperature Accuracy

Dimensions



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Electrical Specification

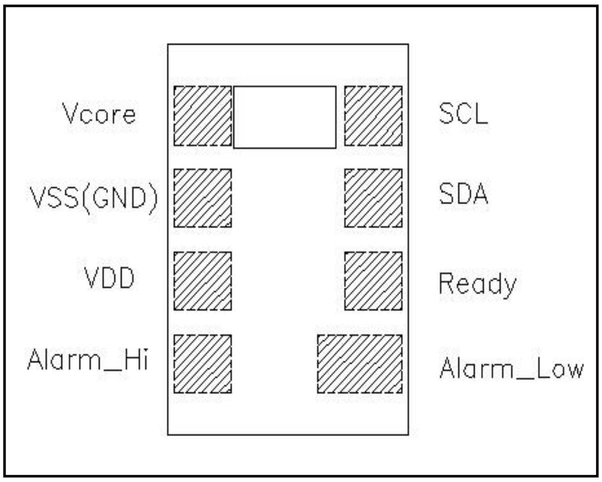
Supply Voltage	min 2.1V ~ max 3.6V
Supply Current (I_{DD})[*1]	13㎂ (typical)

*1. at room temperature

Environmental

Operating Temperature	- 40 ~ 125℃
Operating Humidity	0~100%RH (non condensing)

Pin Connection



Absolute Maximum Rating

Parameter	Min	Max
Supply Voltage (V_{DD})	-0.3V	4.0V
Storage Temp	-40℃	125℃
Junction Temp (T_j)	-40℃	125℃

Soldering Information

Standard or IR Solder Reflow.
IPC/JEDEC standard
T_P ≤250℃, t_P < 10sec, T_L<220℃, t_L<60sec.
Tp(Peak Temperature), t_P(Peak Time),
T_L(Critical Zone Temperature),t_L(Critical Zone Time)
Ramp-up/down speed < 6℃/sec

Package Contents

Capacitive polymer RH Sensor,
Poly Silicon Temperature sensor integrated ASIC chip in LCC (Leadless Chip Carrier) package, SMD.

RoHS Compliant

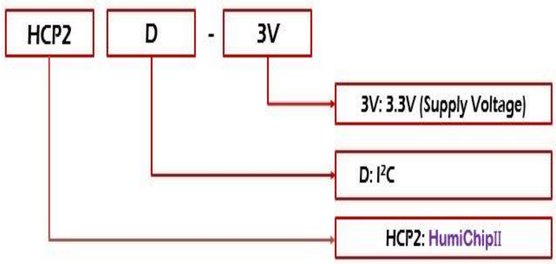
Shipping

Reel & Tape: 500 or 2,500 ea

☞ **To order**

I^2C output **HCP2D-3V**
±2%RH Accuracy (20%~80%RH)
Reel & Tape shipping package

Ordering Part Number



Application Guide

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1. General Information

1.1 Preliminary Consideration

To maximize the performance of **HCP2D-3V**, it is important to plan an appropriate location of the sensor at the design stage. Airflow and proper exposure to ambient air must be secured for **HCP2D-3V** to ensure expected performance. Airflow holes must NOT be blocked. Any heat generating parts near **HCP2D-3V** will distort the proper measurement of relative humidity and temperature reading, and either should be avoided or measures should be taken to prevent heat transfer.

1.2 Operating Conditions

HCP2D-3V's maximum and recommended normal operating condition is shown in **Figure 1**. Within the Normal Range, **HCP2D-3V** performs stably. Prolonged exposures to conditions outside normal range, especially at humidity over 90%RH, may temporarily offset the RH signal up to ±3%RH. When return to Normal Range, it will gradually recover back to the calibration state.

Re-Conditioning Procedure in **Section 1.6** will help reduce this recovery time. Long term exposure to extreme conditions may also accelerate aging of the sensor.

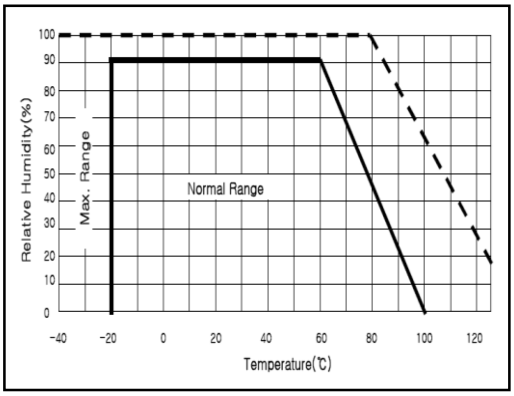


Figure 1 Operating Conditions

1.3 Heating

Heat sources such as power electronics, microcontrollers, and display near the sensor may affect the accurate measurement. The location of Sensor near such heat sources should be avoided by maintaining distance or thermal buffer. Thin metal pattern, or even better, 'milling slits' around the sensor also may help reduce the error.

1.4 Soldering Instruction

HCP2D-3V is designed for mass production reflow soldering process. It is qualified for soldering profile according to IPC/JEDEC J-STD-020D (see **Figure 2**) for Pb-free assembly in standard reflow soldering ovens or IR/Convection reflow ovens to withstand peak temperature at 250℃ and peak time up to 10 sec. For soldering in Vapor Phase Reflow (VPR) ovens the peak conditions are limited to T_P < 250℃ with t_P <10sec and ramp-up/down speeds shall be limited to 6℃/sec.

Note : *Test or measurement right after reflow soldering may read an offset as the sensor needs time for stabilization from the soldering heat. The recovery time may vary depending on reflow soldering* profile and ambient storage condition.

For most of the standard reflow soldering, allow 12 hours of stabilization under room environment (23±3℃, 55±5%RH).

NO extra rehydration process is required after reflow soldering for **HCP2D-3V**.

Contact our **customer support** for optimal reflow soldering process. [sales@samyoungsnc.com]

For **Land Pattern** dimensions, see **Figure 3**.

Note : *The distance between the Vcore capacitor and pad has to be within the 10mm and the tracks of the Power and GND have to be more than 12 mil.*

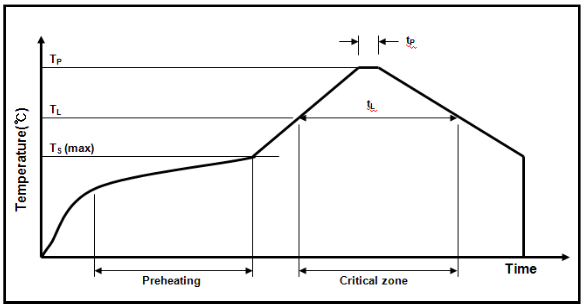


Figure 2　Soldering Profile

IPC/JEDEC standard
T_P ≤250℃, t_P < 10sec, T_L<220℃, t_L<60sec.
Ramp-up/down speed < 6℃/sec.

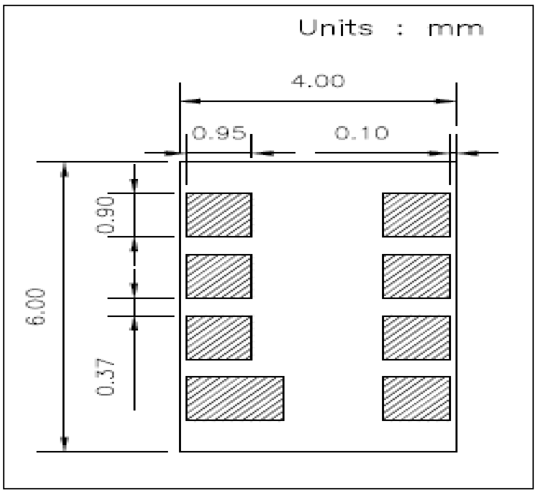


Figure 3　Land Pattern

1.5　Storage and Handling Information

HCP2D-3V contains polymer based capacitive humidity sensor sensitive to environment, and should NOT be handled as an ordinary electronic component.
Chemical vapors at high concentration may interface with the polymer layers, and coupled with long exposure time, may cause a shift in both offset and sensitivity of the sensor.
Despite the sensor endures the extreme conditions of -40℃~125℃, 0%RH~100%RH (non condensing), long term exposure in such environment may also offset the sensor reading. Hence, once the package is opened, it is recommended to store in clean environment of temperature at 5℃~55℃ and humidity at 10%~70%RH.
HCP2D-3V is protected of ESD up to 2000V and Latch-up in the range of ±150㎃ to ±200㎃ and also packed in ESD protected shipping material. Normal ESD precaution is required when handling in assembly process.

1.6　Reconditioning Procedure

If **HCP2D-3V** is exposed or contaminated with chemical vapors, the following reconditioning procedure will recover the sensor back to calibration state.

Baking: **120℃ for 6 hrs** and
Re-Hydration: **30℃ at > 80%RH for 24 hrs**

1.7　Material Contents

HCP2D-3V consists of sensor cell and IC (polymer / glass & silicon substrate) packaged in a surface mountable LCC (Leadless Chip Carrier) type package. The sensor housing consists of a PPS (Poly Phenylene Sulfide) cap with epoxy glob top on a standard FR4 substrate. Pads are made of Au plated Cu. The device is free of Pb, Cd and Hg.

RoHS compliant / REACH report available

1.8　Traceability Information

HCP2D-3V is laser marked with product type and lot identification.
The first line denotes the sensor type: **HCP2D** for **I²C** output.
Lot identification is printed on the second line with 5 digit alphanumeric code.
Further information about individual sensor is electronically stored on the chip.

1.9 Shipping Package

HCP2D-3V is provided in a tape & reel shipment packaging, sealed into antistatic ESD trays. Standard packaging sizes are 2,500 or 500 units per reel. The drawing of the packaging tapes with sensor orientation and packing box dimensions are shown in Figure 4 and Figure 5.

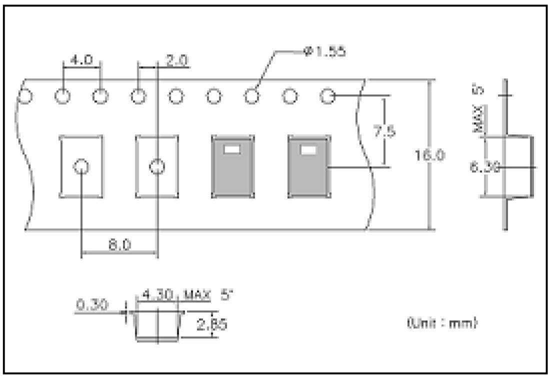


Figure 4 Packing Reel & Tape

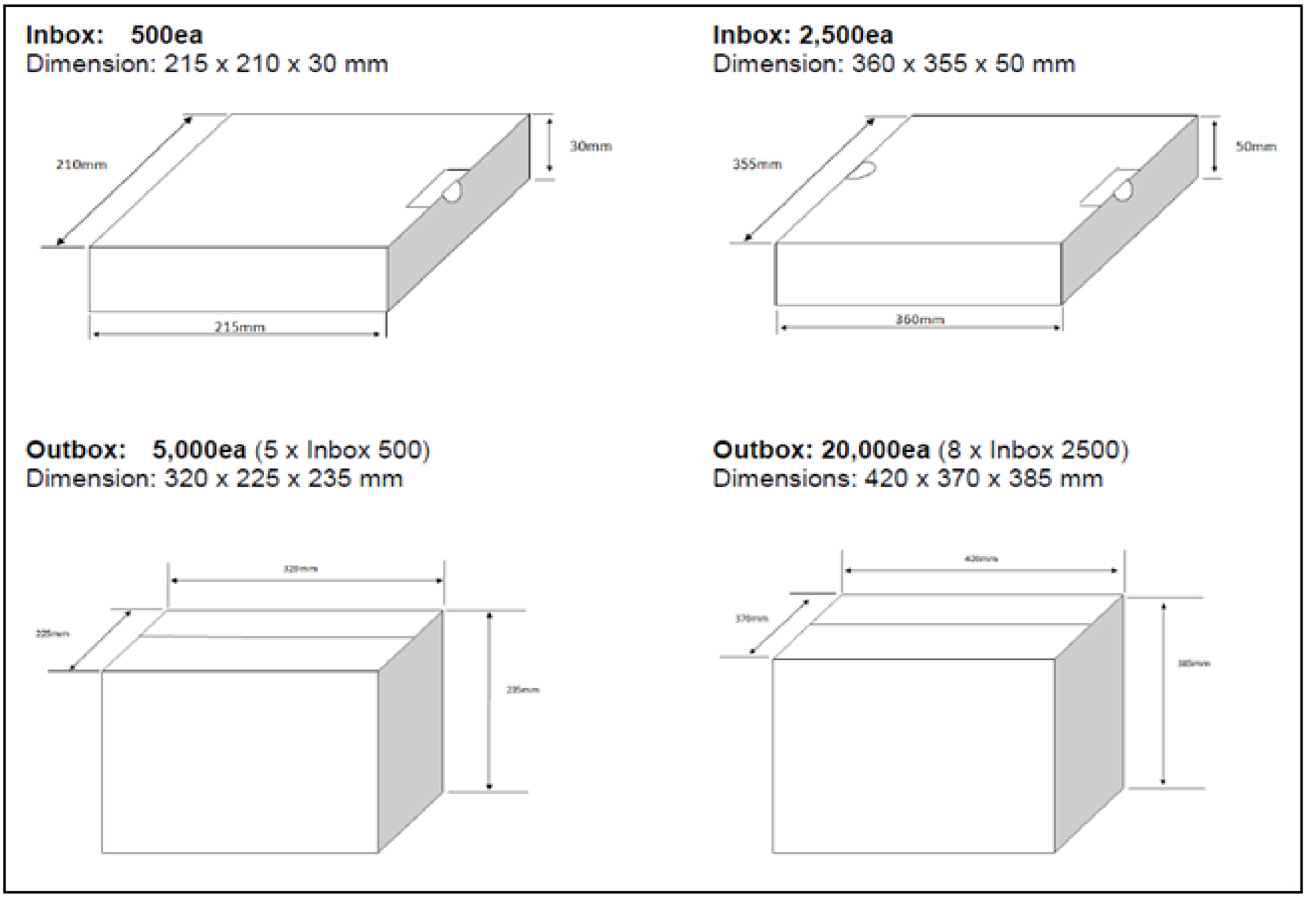
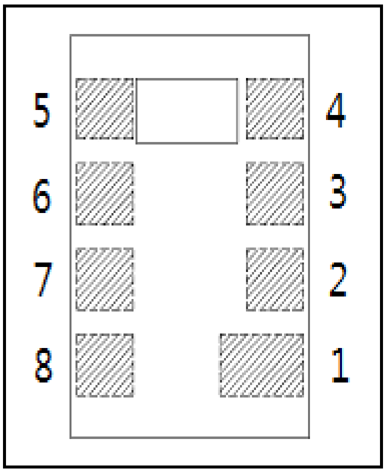


Figure 5 Packing (Box)

2. Interface Specification



Pin No	Digital Output (I^2C Interface)
1	Alarm_Low
2	Ready
3	SDA
4	SCL
5	V_{CORE}
6	VSS
7	VDD
8	Alarm_High

Table 1 Pin Descriptions

2.1 Power Pads (VDD, VSS, V_{CORE})

HCP2D-3V is capable of operating on range of power supply voltage from 2.1V to 3.6V.
Power supply should be connected to VDD(pad7). VDD and VSS(pad6) should be decoupled with a 10㎌ capacitor.

***Note :** Vcore must not be connected to VDD, and it must always be connected to an external 4.7㎌ capacitor to ground. (see **Figure 6**)*

2.2 I^2C Clock & Data Pads (SDA, SCL)

The sensor's data is transferred in and out through the SDA pad while the communication between **HCP2D-3V** and microcontroller (MCU) is synchronized through the SCL pad.
HCP2D-3V has an internal temperature compensated oscillator that provides time base for all operation, and uses an I^2C-compatible communication protocol with support up to 100㎑ bit rates.
External pull-up resistors are required to pull the drive signal high, that can be included in I/O circuits of microcontroller. (see **Figure 6**)
If pads(SDA and SCL) are not used, SCL should be connected to VDD and SDA should be connected GND.

Further information about timing and communication between the sensor and microcontroller is explained in **Section 4.** Communicating with **HCP2D-3V**.

2.3 Alarm Pads (Alarm_Low, Alarm_High)

The alarm output can be used to monitor whether the sensor reading has exceeded or fallen below pre-programmed values. The alarm outputs are full push-pull driver type. If a high voltage application is required, external devices can be controlled with the Alarm pins.
The two alarm outputs can be used simultaneously, and these alarms can be used in combination with the I^2C. Further information about Alarm control is explained in **Section 6.**

2.4 Ready Pad (Ready)

The signal on Ready pad indicates whether the output data is valid or not. It can be used connecting to interrupt pin or GPIO in microcontroller. If it is not used, it can be left unconnected.

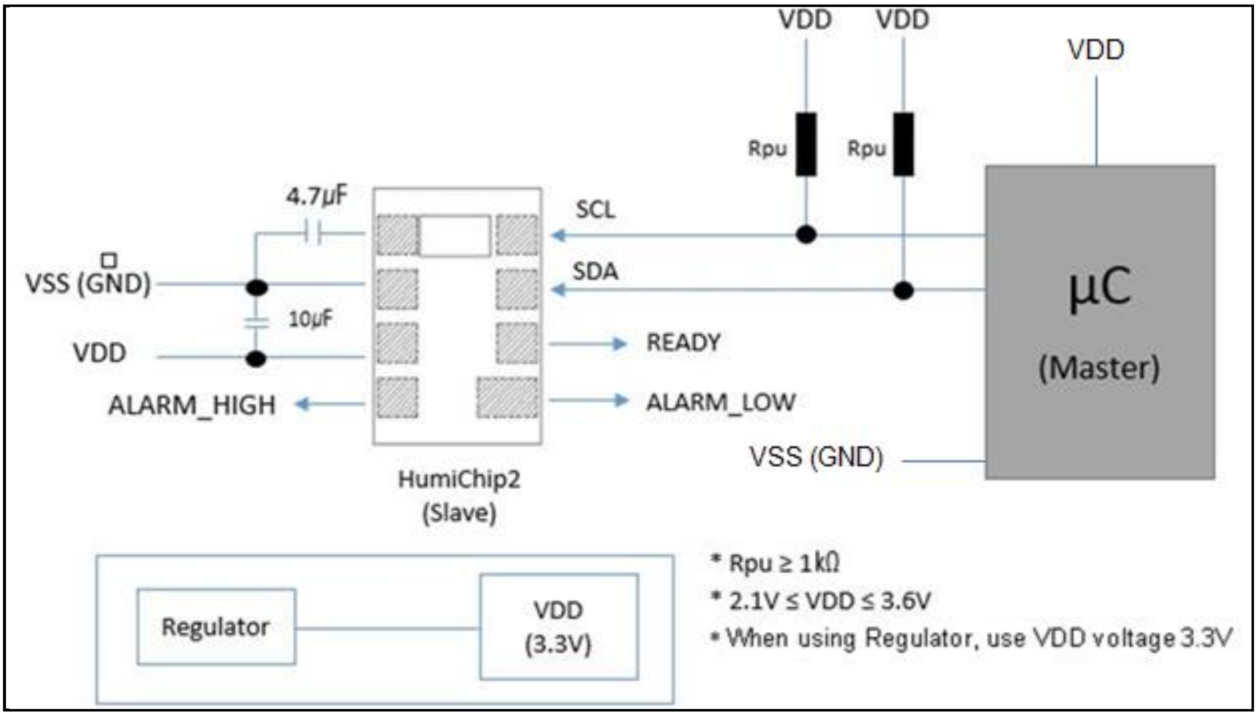


Figure 6 Typical Application Circuit

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3. Electrical Specification

3.1 Absolute Maximum Rating

Table 2 shows the Absolute Maximum Ratings for **HCP2D-3V**. Exposure to these extreme condition for extended period may deteriorate the sensor performance and accelerate aging. Functional operation is not implied at these conditions.

3.2 Electrical Specification and Recommended Operating Conditions

The operating conditions recommended for **HCP2D-3V** is given in the electrical specification is shown in Table 4.

.

3.3 Output Pad Drive Strength

Output pad drive strength is 4mA.

3.4 ESD

All pins have an ESD rating of up to 2kV. The ESD test follows the Human Body Model with C=150pF and R=330Ω based on IEC61000-4-2

Table 2 Absolute Maximum Rating

PARAMETER	SYMBOL	MIN	MAX	Unit
Supply Voltage (VDD to GND)	V_{SUPPLY}	-0.3	4.0	V
Storage Temperature Range	T_{STG}	-40	125	°C
Junction Temperature	T_j	-40	125	°C

Table 3 Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	V_{DD}	2.1		3.6	V
Ambient Temperature Range	T_{AMB}	-40		125	°C
External Capacitance between V_{DD} pin and Gnd	$C_{VSUPPLY}$		10		μF
External Capacitance between Vcore and Gnd	C_{VCORE}		4.7		μF
Pull-up on SDA and SCL*1	R_{PU}	1			kΩ

*1 : The SDA and SCL should not be left in the open state..

*2 : For the capacitor, the X7R or C0G is recommended.

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Table 4 Electrical Characteristics Specifications

PARAMETER	SYMBOL	REMARKS	MIN	TYP	MAX	UNIT
Current consumption	I_{DD}	At 3V, 1Hz		13		μA
Digital port voltage	$V_{IO\_DIGITAL}$	Relative to ground	-0.6	3.3	V_{DD}+0.6 ≤ 3.6	V
Digital ports switching level		HIGH → LOW LOW → HIGH		0.3*V_{DD} 0.7*V_{DD}		V
Start-Up-Time， Power-on (POR) to data ready	t_{STA}				10	ms
Measuring Rate				5		Hz
EEPROM Data Retention Period		at 95℃ temperature			10	Year
OTP Data Retention Period		at 95℃ temperature			10	Year

4. Communicating with HCP2D-3V

4.1 Power–On Sequence

On system Power-On-Reset, the **HCP2D-3V** wakes as an I²C device. After power-on-reset, start-up-time is required 10㎳.
The CDC is triggered by the conversion timer. After the CDC is completed, the RDC will be performed sequentially. Then the DSP calculate and update the humidity and temperature to Result Register. The measurement rate is 5㎐ (200㎳) by conversion timer. See the Figure 7 Power-on Sequence.

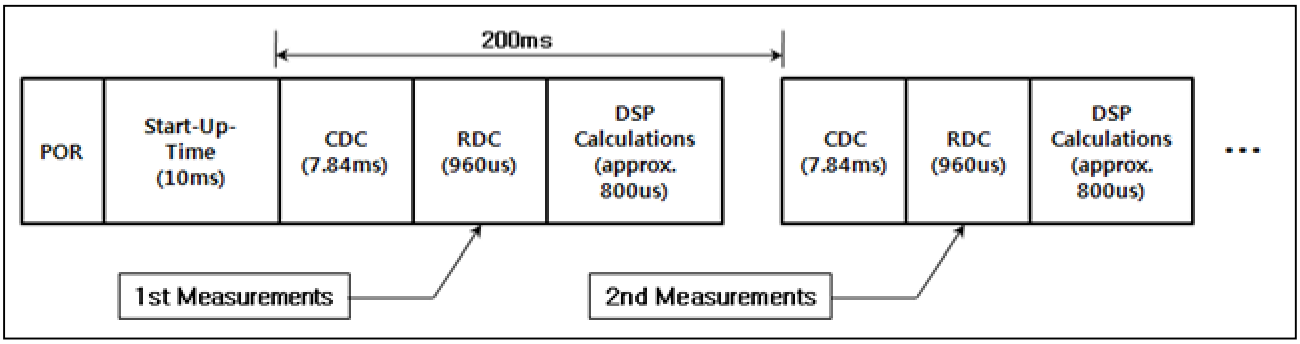

Figure 7 Power-On Sequence

4.2 I²C Compatible Interface

The present paragraph outlines the **HCP2D-3V** device specific use of the I²C interface. The external master (**HCP2D-3V** cannot be master) begins the communication by creating a start condition, falling edge on the SDA line while SCL is HIGH. It stops the communication by a stop condition, a rising edge on the SDA line while SCK is high. Data bits are transferred with the rising edge of SCK.

On I²C buses, every slave holds an individual 7-bit device address (0x28 fixed). This address always has to be sent as the first byte after the start condition. The eighth bit indicating the direction of the following data transfer (Read : 1 and Write : 0). The address byte is followed by the opcode and eventually the payload. Each byte is followed by an acknowledge bit (0 : when a slave acknowledges).

MSB							LSB
0	1	0	1	0	0	0	R/W

Figure 8 Address Byte

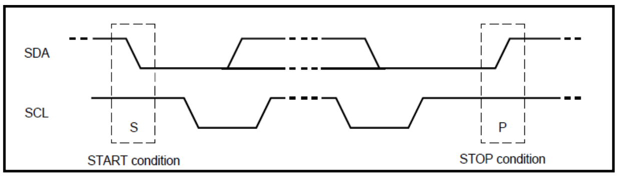

Figure 9 START and STOP condition

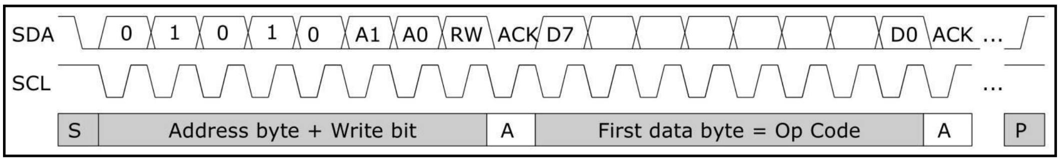

Figure 10 I²C principle sequence

4.2.1 I²C Write

During write transactions, the master alone sends data, the addressed slave just sends the acknowledge bit. The master first sends the slave address plus the write bit. Then it sends the **HCP2D-3V** specific opcode including the register address in the slave. Finally it sends the payload ("Data").

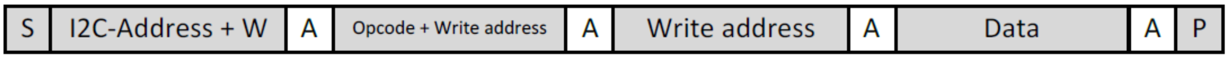

Figure 11 I²C Write procedure

4.2.2 I²C Read

During read transactions, the direction of communication has to be commuted. Therefore, the master creates again a start condition and sends the slave address plus the read bit (instead of the write bit) to switch into read mode. Figure 12 shows.

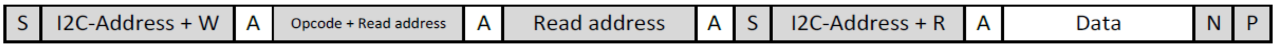

Figure 12 I²C Read procedure

After arrival of the first (or any) data byte, the master may be either signal Not-Acknowledge or Acknowledge.
Not-Acknowledge (=N=1) indicate "end of read" and "stop sending" to the slave.
Acknowledge (=A=0) indicate "continue in automatic address-increment mode" and thus receive many bytes in a row. As one can see, automatic address increment is particularly useful and efficient with the I²C interface.

4.2.3 I²C Timing

The **HCP2D-3V** uses I²C-compatible communication protocol with support for Max 100 ㎑ bit rates. See Figure 13 and Table 5.

Note : Please refer to the I²C-bus specification for Detailed Timing Chart. And Reference Programming Code are available upon request.

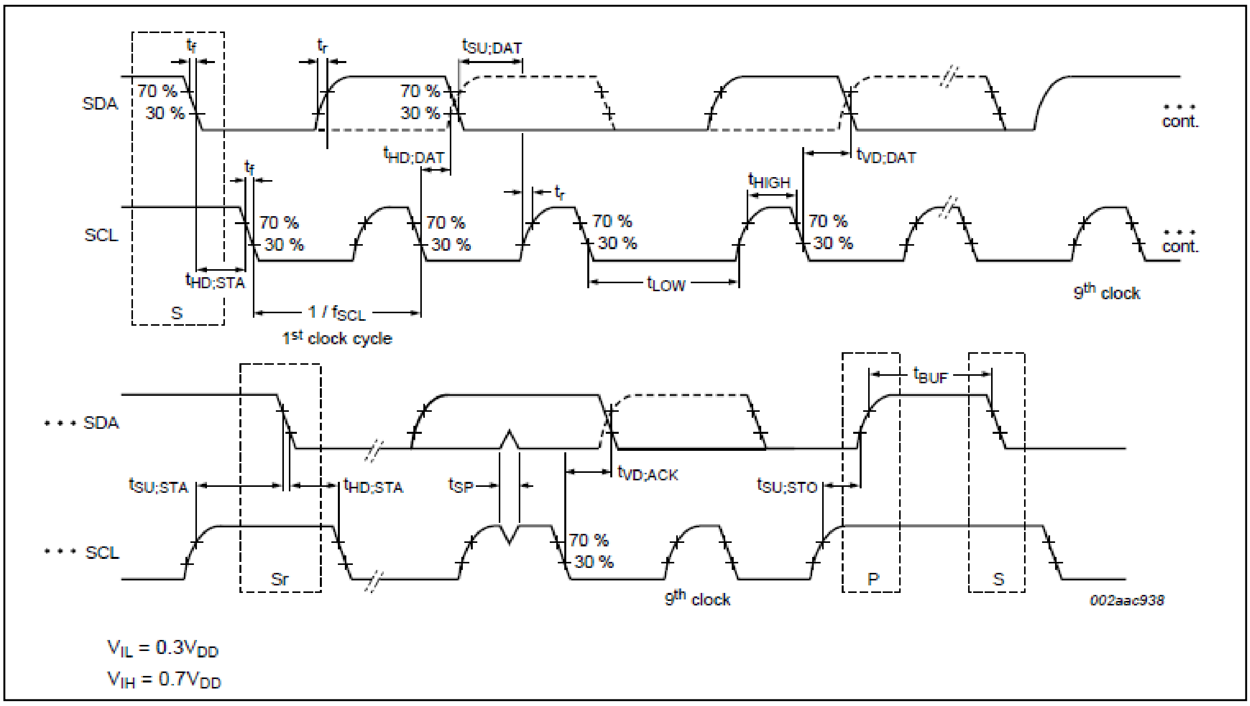

Figure 13 Definition of timing for device on the I²C-bus

Table 5 Characteristics of the SDA and SCL bus lines

PARAMETER	SYMBOL	MIN	MAX	UNIT
SCL clock frequency*1	f_{SCL}	0	100	㎑
hold time (repeated) START condition	$t_{HD:STA}$	4.0		㎲
LOW period of the SCL clock	t_{LOW}	4.7		
HIGH period of the SCL clock	t_{HIGH}	4.0		
set-up time for a repeated START condition	$t_{SU:STA}$	4.7		
data hold time*2	$t_{HD:DAT}$	0		
data set-up time	$t_{SU:DAT}$	250		ns
rise time of both SDA and SCL signals	t_r		1000	ns
Fall time of both SDA and SCL signals	t_f		300	ns
set-up time for STOP condition	$t_{SU:STO}$	4.0		㎲
Bus free time between a STOP and START condition	t_{BUF}	4.7		㎲
capacitive load for each bus line	C_b		400	pF
data valid time	$t_{VD:DAT}$		3.45	㎲
data valid acknowledge time	$t_{VD:ACK}$		3.45	㎲

1. Overclocking is technically possible but within the sole responsibility of the customer (a license may be necessary)

2. The data hold time that is measured from the falling edge of SCL, applies to data in transmission and the acknowledge.

A device must internally provide a hold time of at least 300 ns for the SDA signal to bridge the undefined region of the falling edge of SCL.

4.3 Opcode

All commands for write or read to memory or configuration or result registers may use explicit addressing or address auto-increment.

Note : *Besides the case of reading the result registers, it is recommended to deactivate the converter for any communication to configuration registers or EEPROM. This is done by setting the RunBit to '0'. After the communication process the RunBIt needs to be set back to '1'.For more details, see the* ***Section 4.7.***

Table 6 Opcode

Description	BYTE 2								BYTE 1		BYTE 0
Read Result	0	1	0	0	0	0	0	0	0	Addr <6..0>	
Write configuration	1	1	0	0	0	0	0	0	0	Addr <6..0>	Data <7..0>
Write EEPROM	1	1	1	0	0	0	0	0	0	Addr <6..0>	Data <7..0>
Read EEPROM	0	1	1	0	0	0	0	0	0	Addr <6..0>	
Erase EEPROM	1	1	1	0	0	0	1	0	0	Addr <6..0>	[Dummy Byte]
Power-on Reset*1	1	0	0	0	1	0	0	0			

1. It takes about 280us until the first(cdc) measurement starts.

4.4 Data Fetch

The Data Fetch (DF) command is used to fetch data from **HCP2D-3V**. An I^2C Data Fetch command starts with the 7-bit slave address and the 8^{th} bit 1(Read). The **HCP2D-3V** as the slave sends an acknowledgement (ACK) indicating success.

The number of data bytes returned by the **HCP2D-3V** is determined by when the master sends the NACK and stop condition. Figure 14 shows examples of fetching three bytes respectively.

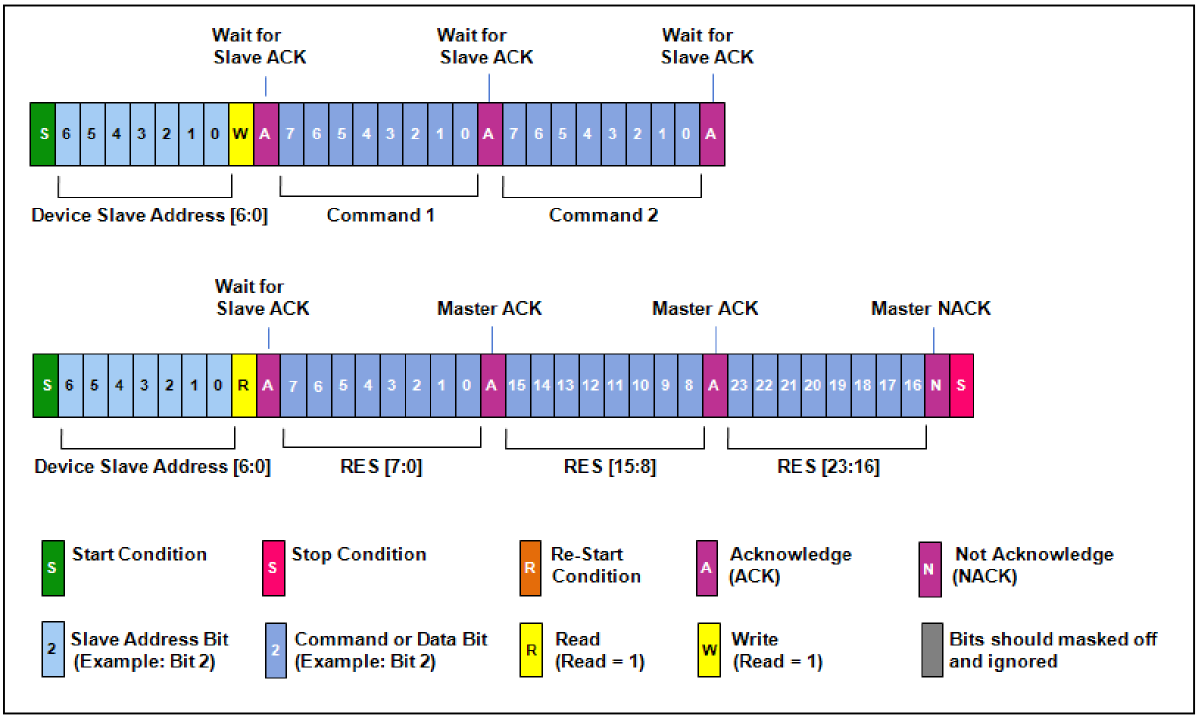

Figure 14 I^2C Measurement Packet Reads

The data has to be read from Result Register (see Table 8) using the Read Result command in order to fetch the humidity and temperature. Read Result command consists of 0x40 and 7-bit address. 7-bit address is 0x00(for temperature) or 0x03(for humidity). After commands are transferred, 3-bytes data is read from **HCP2D-3V**. First 2-bytes are humidity or temperature. They are signed integer, two's complement fixed- point. The lower byte is fractional digits and the higher byte is integer values. Third byte is Checksum. If it is not used, only 2-bytes can be read.
The checksum and output data are calculated as

Table 7.

To read temperature and humidity at a time, data of 6-Bytes can be fetched from **HCP2D-3V** after commands (0x40+0x00) are sent. The first 3-bytes are temperature and the next 3-bytes are humidity.

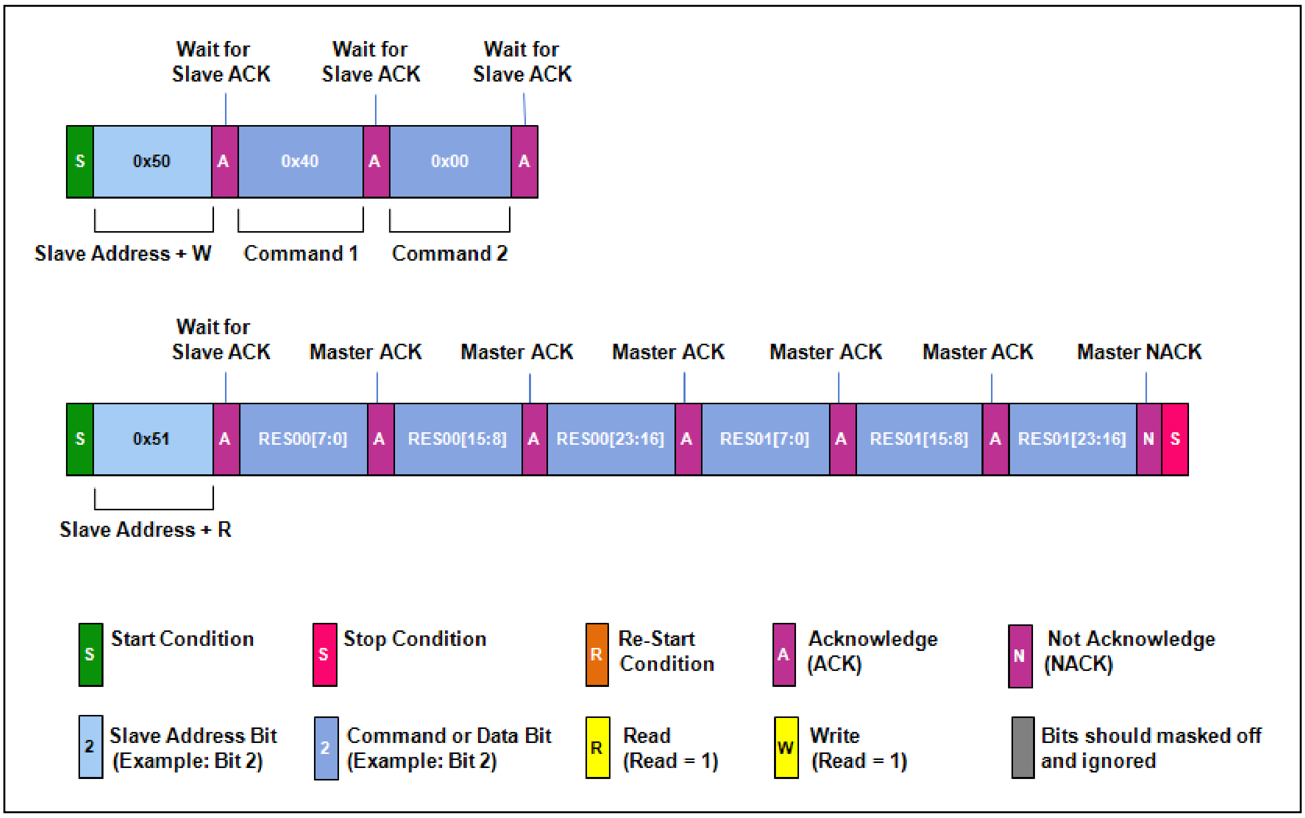

Figure 15 Example : Temperature and Humidity data fetch

Table 7 Humidity & Temperature Conversion Formula

Humidity & Temperature Conversion Formula	
Humidity Output (%RH)	RES01[15:0] / 256
Temperature Output (°C)	RES00[15:0] / 256
Checksum	RES[23..16] = (RES[15..8] + RES[7:0]) % 256

Note : *'%' symbol in Checksum Formula means mod operation.*

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Table 8 Result Register

Name	Res	Address	fpp	Description
Temperature (℃)	00	0..2	8	Determined temperature in ℃ (-40 ~ 125℃)
Humidity (%RH)	01	3..5	8	Determined relative humidity in %RH (0 ~ 100%RH) (Temperature compensated)

4.5 Ready Pin

The READY signal is intended to show that measurement data is processed and ready to fetch. After power-up, the READY is 0. When the measure data is processed and ready to fetch, the READY is set to 0. **HCP2D-3V** is able to detect interface activity. When interface activity (reading of measure data) is detected, READY is set back to 1.

The Ready pin's output driver type is full push-pull. Point-to-point communication most likely uses the full push-pull driver.

Note : *If the output mode is Analog, the ready signal cannot be used.*

4.6 EEPROM

The EEPROM array contains the calibration coefficients for gain and offset, etc., and the configuration bits for the output modes, measuring rate, etc.. The **HCP2D-3V** EEPROM is arranged as 127 Bytes (see Table 12).

See **Section 4.3** for instructions on reading and writing to the EEPROM via the I²C interface. When programming the EEPROM, an internal charge pump voltage is used; therefore a high voltage supply is not needed.

Only 1's can be written to the EEPROM. Therefore, it is necessary to erase the EEPROM cells before writing new data. EEPROM communication may use address auto-increment. In case of "Erase EEPROM" the incremental write is achieved by sending additional dummy bytes.

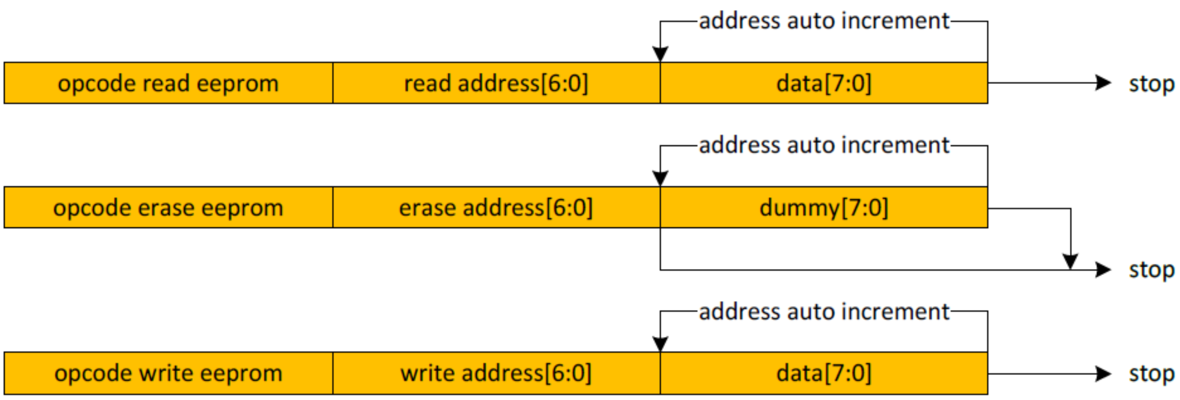

Figure 16 EEPROM communication

It is necessary to wake up the EEPROM before each write access. Therefore, enable EEPROM after clear RunBit. The EEPROM wakeup can be done explicitly or automatically. It is mandatory to take care of the setup timings, for each individual byte

Table 9 EEPROM Timings

Symbol	Description	Typ.
t_{rdsu}	Set-up Time for reading	300μs
t_{rd}	Read Time from EEPROM	600ns
t_{wrsu}	Set-up Time for Writing	200μs
t_{wr}	Write Time to EEPROM	6.8ms

4.7 Configurations

4.7.1 RunBit

The RunBit enables or disables the front-end and the DSP. It is indicated in the Status Register bit0. When the Configuration Register or EEPROM is accessed, the Runbit should be '0'. Then, as a last step, RunBit should be set to '1' again.
Use the POR command in order to re-start the measurement after access is completed.

Table 10 Commands for configurations

Command	CMD1	CMD2	CMD3
Set RunBit	0xC0	0x4D	0x01
Clear RunBit	0xC0	0x4D	0x00
Enable EEPROM	0xC0	0x1C	0xC4
Disable EEPROM	0xC0	0x1C	0x44

4.7.2 Status Register

Address 24 in the Result Register is the Status Register. The EEPROM state and the RunBit are displayed in the Status Register.

For more information, see **Section 4.6 EEPROM** and **Section 4.7.1 RunBit**.

Table 11 Status Register Details

Bit#	Name	Description
0	RunBit	Run Bit (0: Disable, 1: Enable)
2:1	Reserved	
3	EE_BUSY	EEPROM busy
7:4	Reserved	

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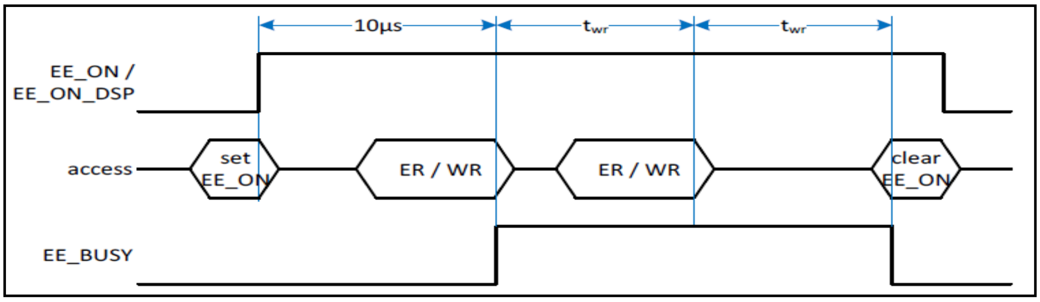

Figure 17 EEPROM power controlled by user : Write / Erase

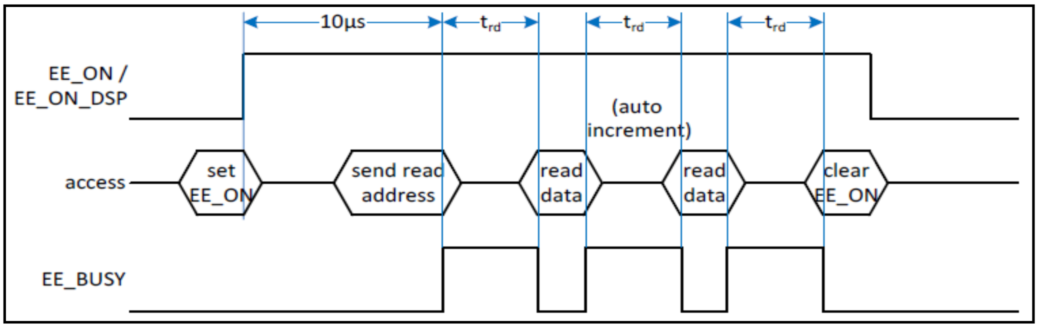

Figure 18 EEPROM power controlled by user : Read

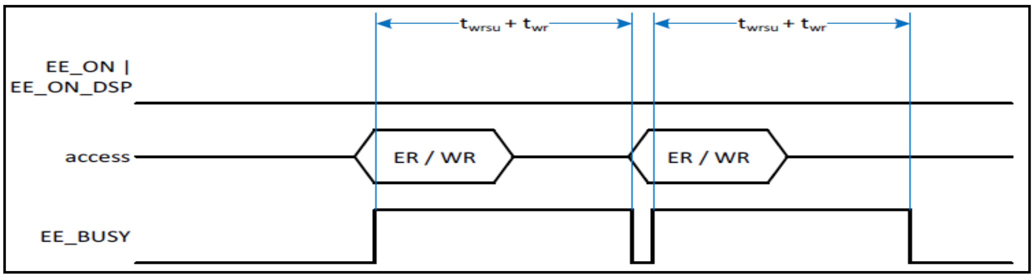

Figure 19 EEPROM power controlled automatically : Write / Erase

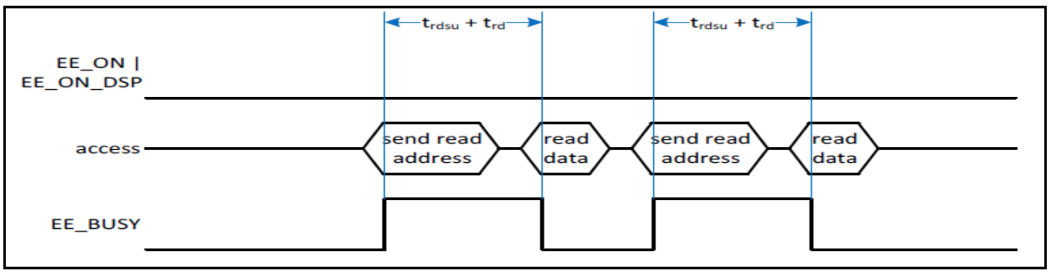

Figure 20 EEPROM power controlled automatically : Read

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Table 12 EEPROM Assignments

Address (HEX)	Bit Range	Default	Name	Description and Notes
84(54h)	15:8	0x00	Alarm_High_On	High alarm on trip point (16bits signed integer, two's complement, fixed point with 8fpp)
85(55h)	7:0	0x00		
86(56h)	15:8	0x00	Alarm_High_Off	High alarm off trip point (16bits signed integer, two's complement, fixed point with 8fpp)
87(57h)	7:0	0x00		
88(58h)	15:8	0x00	Alarm_Low_Off	Low alarm off trip point (16bits signed integer, two's complement, fixed point with 8fpp)
89(59h)	7:0	0x00		
90(5Ah)	15:8	0x00	Alarm_Low_On	Low alarm on trip point (16bits signed integer, two's complement, fixed point with 8fpp)
91(5Bh)	7:0	0x00		

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5. Alarm Function (Optional)

5.1 Alarm Output

The alarm output can be used to monitor whether Humidity reading has exceeded or fallen below pre-programmed values. The alarm is functioned as a full push-pull driver. If a high voltage application is required, external devices can be controlled with the Alarm pads, as demonstrated in **Figure 23**.

In standard **HCP2D-3V** Analog Output mode, only the High Alarm can be used.

5.2 Alarm Registers

Four registers (Alarm_High_On, Alarm_High_Off, Alarm_Low_On, and Alarm_Low_Off) are associated with the alarm functions. (see

Table 12) Each of these four registers is a 2-byte value that determines where the alarms turn on or off. The two high alarm registers form the output with hysteresis for the Alarm_High pin, and the two low alarm registers form the output with hysteresis for the Alarm_Low pin.

5.3 Alarm Operation

As shown in **Figure 21** the Alarm_High_On register determines where the high alarm trip point is and the Alarm_High_Off register determines where the high alarm turns off if the high alarm has been activated. The high alarm hysteresis value is equal to Alarm_High_On – Alarm_High_Off. The same is true for the low alarm where Alarm_Low_On is the low alarm trip point with Alarm_Low_Off determining the alarm shut off point. The low alarm hysteresis value is equal to Alarm_Low_Off – Alarm_Low_On.

Figure 22 shows output operation flowcharts for both the Alarm_High and Alarm_Low pins.

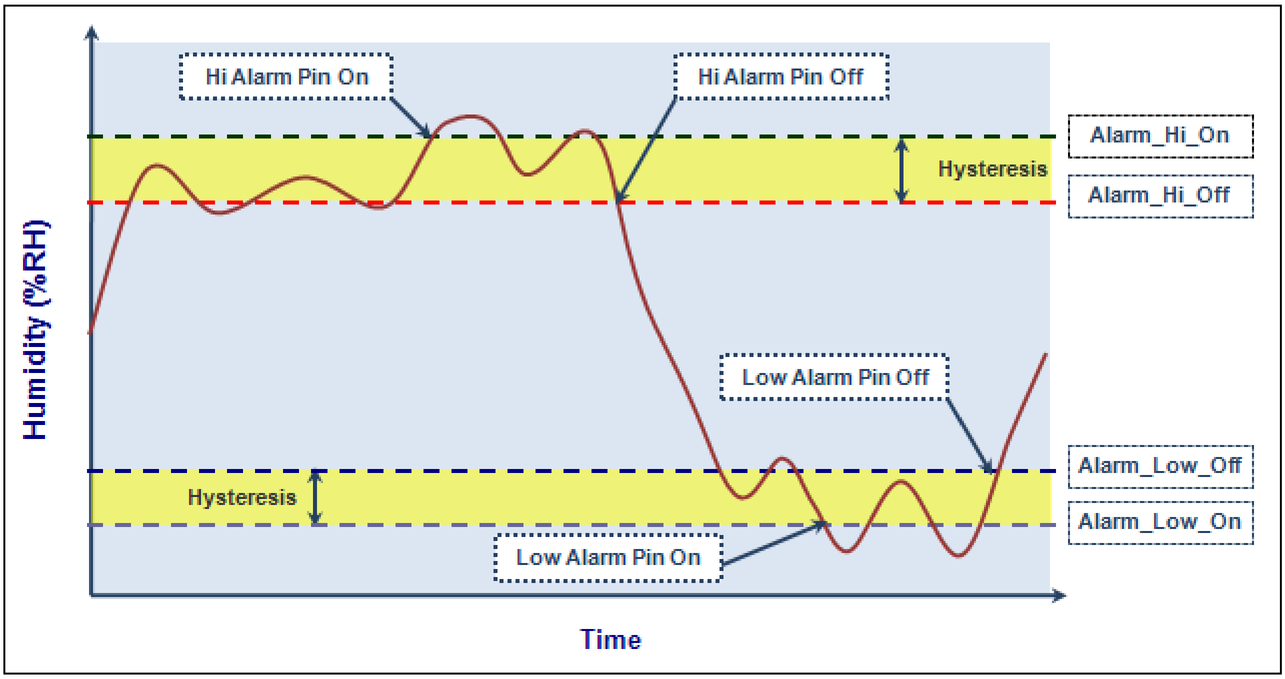

Figure 21 Example of Alarm Function

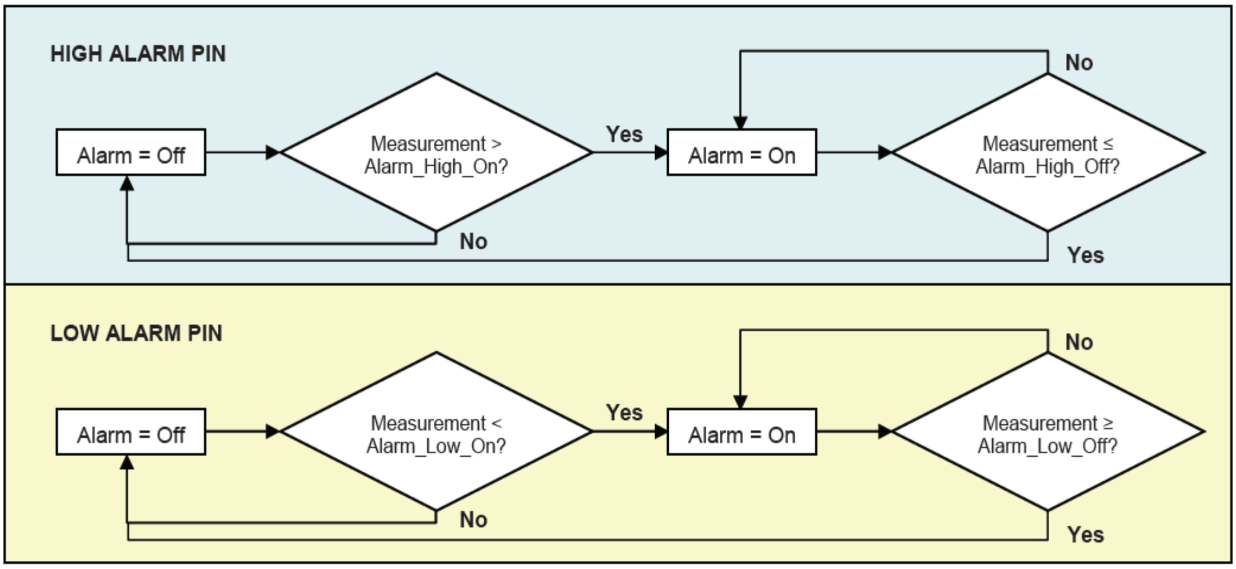

Figure 22 Alarm Output Flow Chart

HCP2D-3V also can be directly installed to a device without MCU interface when only a switch on/off function is required at desired humidity level. (e.g. Bathroom Vent Fan, Humidifiers, Dehumidifiers)

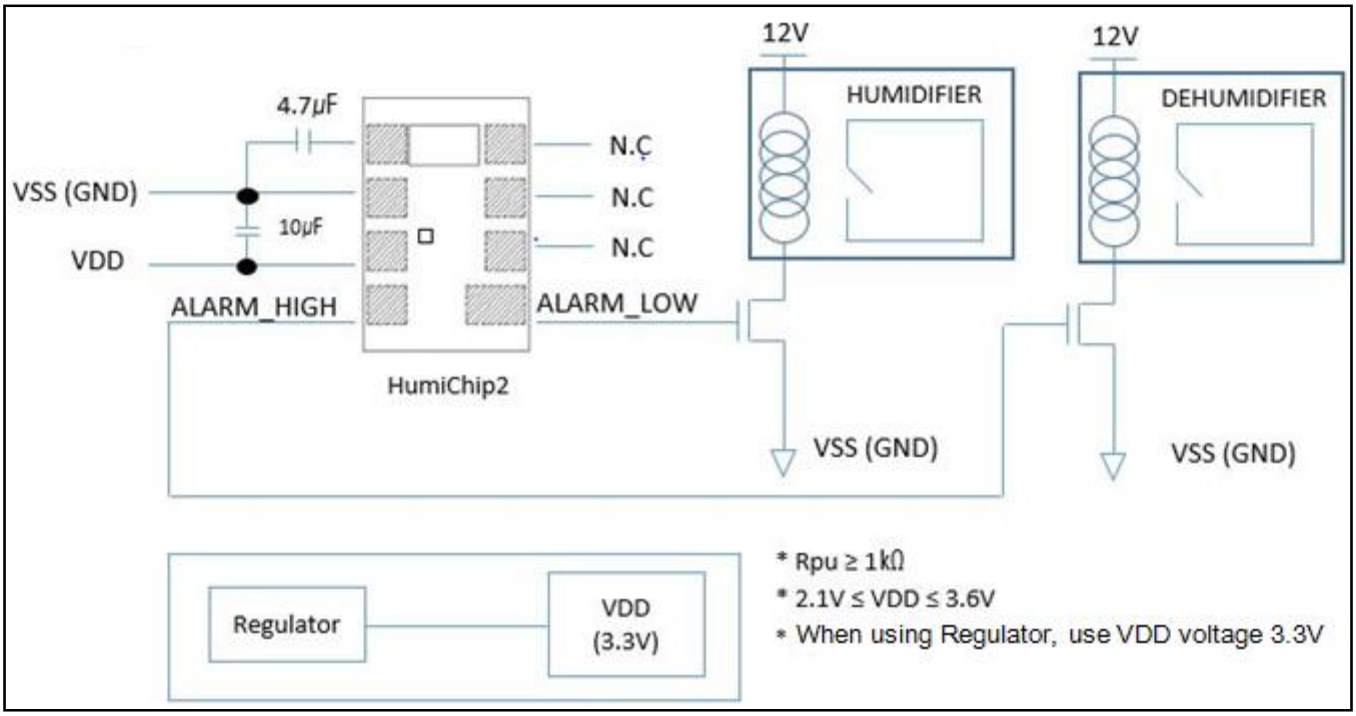

Figure 23 Bang-Bang Humidity Control (Digital Output)

6. Revision History

Date	Version	Page(s)	Changes
11 SEPTEMBER 2015	1.0		First Release

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