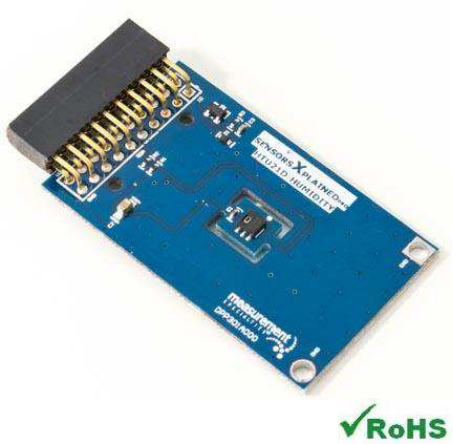


MEAS HTU21D XPLAINED PRO BOARD

Digital Humidity
Digital Component Sensor (DCS) Development Tools

The HTU21D Xplained Pro provides the necessary hardware to interface the HTU21D digital relative humidity and temperature sensor to any system that utilizes Xplained Pro compatible expansion ports configurable for I²C communication. The HTU21D sensor is a self-contained humidity and temperature sensor that is fully calibrated during manufacture. The sensor can operate from 1.5V to 3.6V, has selectable resolution, low battery detect, and checksum capability. The HTU21D has a low power stand-by mode for power-sensitive applications.

Refer to the HTU21D data sheet for detailed information regarding operation of the IC:
http://www.measspec.com/downloads/xxxxxxxxx.pdf

Performance

- 0% to 100% relative humidity range
- -40°C to 125°C temperature range
- Very low power consumption
- Operates from 1.5V to 3.6V
- Fast response time – 5 seconds typical
- Built-in heater for fast recovery from saturation
- Recovers fully from condensation
- Fast conversion time – 14ms typical

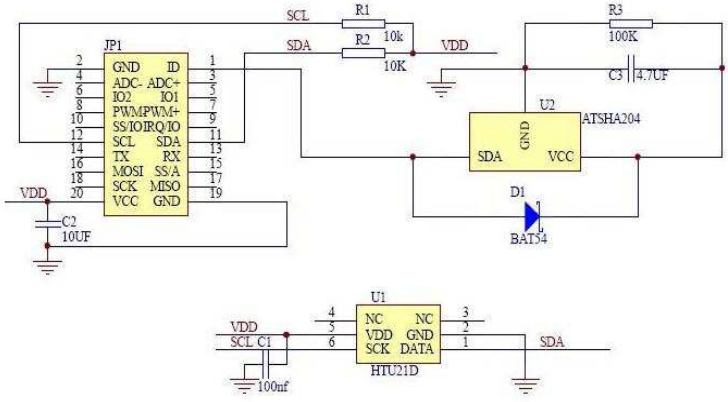
Features

- 20-pin Xplained Pro compatible connector
- I²C interface
- Xplained Pro Hardware identification Chip
- Atmel Studio 6 Project available for download
- µC C code available for download
- Selectable 8-12 bit resolution for humidity
- Selectable 12-14 bit resolution for temperature

Specifications

- Measures relative humidity from 0% to 100%
- Measures temperature from -40°C to 125°C
- I²C communication
- Fully calibrated
- Fast response time
- Selectable resolution
- Very low power consumption

Schematic

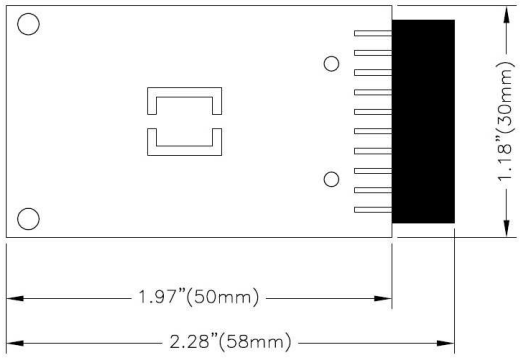


Connector Pin Assignments (I^2C Communications)

System Plug

Connector JP1					
Pin No.	**Signal**	**Description**	**Pin No.**	**Signal**	**Description**
1	ID	Hardware identification	11	SDA	TWI Serial Data
2	GND	Ground	12	SCL	TWI Serial Clock
3	N/C	Not Connected	13	N/C	Not Connected
4	N/C	Not Connected	14	N/C	Not Connected
5	N/C	Not Connected	15	N/C	Not Connected
6	N/C	Not Connected	16	N/C	Not Connected
7	N/C	Not Connected	17	N/C	Not Connected
8	N/C	Not Connected	18	N/C	Not Connected
9	N/C	Not Connected	19	GND	Ground
10	N/C	Not Connected	20	Vdd	Power Supply

Dimensions (mm)



Detailed Description

I^2C Interface

The peripheral module can interface to the host being plugged directly into an Xplained Pro extension port (configured for I^2C) through connector JP1.

External Control Signals

The IC operates as an I^2C slave using the standard 2 wire I^2C connection scheme. The IC is controlled either by the host (through the Xplained Pro connector). In cases where one or more of the SCL and SDA signals are driven from an external source, 10k resistors R1, R2 provide pull-up. However, this also increases the apparent load to the external driving source. If the external source is not capable of driving these loads (10k), they should be removed.

Reference Materials

The complete software kit is available for download at: http://www.meas-spec.com/TBD/xxxxx.zip
Xplained Pro Extension Product Data Sheet: http://www.meas-spec.com/downloads/xxxxxxxxx.pdf

Drivers & Software

Detailed example software and drivers are available that execute directly without modification on a number of development boards that support an integrated or synthesized microprocessor. The download contains several source files intended to accelerate customer evaluation and design. The source code is written in standard ANSI C format, and all development documentation including theory/operation, register description, and function prototypes are documented in the interface file.

Functions Summary

Enumerations	

enum	**htu21_i2c_master_mode** {
	htu21_i2c_hold,
	htu21_i2c_no_hold
	}

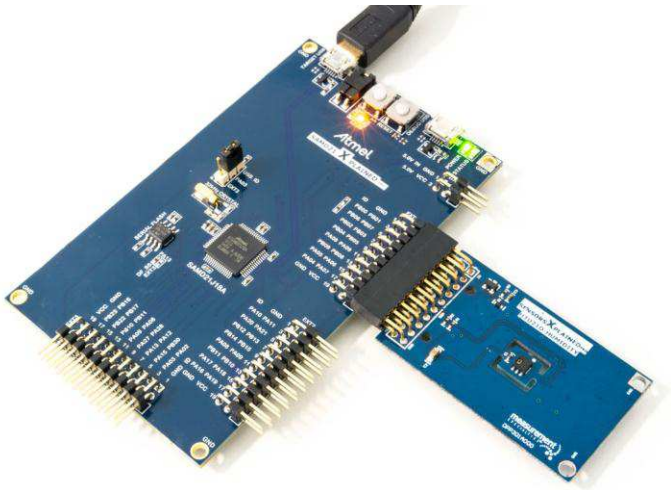
enum	**htu21_status** {
	htu21_status_ok, **htu21_status_no_i2c_acknowledge**,
	htu21_status_i2c_transfer_error, **htu21_status_crc_error**
	}

enum	**htu21_resolution** {
	htu21_resolution_t_14b_rh_12b = 0, **htu21_resolution_t_12b_rh_8b**,
	htu21_resolution_t_13b_rh_10b, **htu21_resolution_t_11b_rh_11b**
	}

enum	**htu21_battery_status** { **htu21_battery_ok**, **htu21_battery_low** }
enum	**htu21_heater_status** { **htu21_heater_off**, **htu21_heater_on** }
Functions	
void	**htu21_init** (void)
	Configures the SERCOM I2C master to be used with the HTU21 device.
bool	**htu21_is_connected** (void)
	Reset the HTU21 device.
enum htu21_status	**htu21_reset** (void)
	Reset the HTU21 device.
enum htu21_status	**htu21_read_serial_number** (uint64_t *)
	Reads the htu21 serial number.
enum htu21_status	**htu21_set_resolution** (enum htu21_resolution)
	Set temperature and humidity ADC resolution.
void	**htu21_set_i2c_master_mode** (enum htu21_i2c_master_mode)
	Set I2C master mode. This determines whether the program will hold while ADC is accessed or will wait some time.
enum htu21_status	**htu21_read_temperature_and_relative_humidity** (float *, float *)
	Reads the relative humidity value.
enum htu21_status	**htu21_get_battery_status** (enum htu21_battery_status *)
	Provide battery status.
enum htu21_status	**htu21_enable_heater** (void)
	Enable heater.
enum htu21_status	**htu21_disable_heater** (void)
	Disable heater.
enum htu21_status	**htu21_get_heater_status** (enum htu21_heater_status *)
	Get heater status.
float	**htu21_compute_compensated_humidity** (float, float)
	Returns result of compensated humidity.
float	**htu21_compute_dew_point** (float, float)
	Returns the computed dew point.

Project Setup

This project is based on ATSAMD20J18 board with Measurement Specialties Xplained Pro extension board connected to EXT1 pad as shown on figure below.



Running the Application

1. Download the HTU21D Xplained Pro example package on MEAS Web Page
2. Decompress the archive file
3. Open the .cproj project file with Atmel Studio 6
4. You will now be able to build the HTU21D example project -
5. Finally, run the build result on your Xplained Pro Board -

Application Code

This section is intended to provide a basic example of functionality.

```
/**
 * \file main.c
 *
 * \brief HTU21 Temperature & Humidity monitoring application file
 *
 * Copyright (c) 2014 Measurement Specialties. All rights reserved.
 *
 */

#include <asf.h>

uint64_t serial;
float temperature;
float relative_humidity;
float compensated_humidity;
float dew_point;
enum htu21_heater_status heater;

int main (void)
```

```
{
	enum htu21_status status;
	float last_temperature = 0;
	float variation = 0;
	uint8_t n=0;

	system_init();
	delay_init();

	// Configure device and enable
	htu21_init();

	if( !htu21_is_connected() )
		return -1;

	// Reset HTU21
	status = htu21_reset();
	if( status != htu21_status_ok)
		return -1;

	// Read serial number
	status = htu21_read_serial_number(&serial);
	if( status != htu21_status_ok)
		return -1;

	// Configure resolution
	status = htu21_set_resolution(htu21_resolution_t_12b_rh_8b);
	if( status != htu21_status_ok)
		return -1;

	// Monitor temperature every 500ms
	while (1) {

		// Enable heater for 10s
		if( (n==10) ) {
			status = htu21_enable_heater();
			if( status != htu21_status_ok)
				return -1;
		}
		// Disable heater after 20s
		if( (n==20) ) {
			status = htu21_disable_heater();
			if( status != htu21_status_ok)
				return -1;
		}

		// Check heater status
		status = htu21_get_heater_status(&heater);
		if( status != htu21_status_ok)
```

```
                return -1;

            // Alternate between w and w/o hold temperature read
            if( n&1 )
                htu21_set_i2c_master_mode(htu21_i2c_no_hold);
            else
                htu21_set_i2c_master_mode(htu21_i2c_hold);

            status = htu21_read_temperature_and_relative_humidity(&temperature, &relative_humidity);
            if( status != htu21_status_ok)
                return -1;

            compensated_humidity = htu21_compute_compensated_humidity(temperature,relative_humidity);
            dew_point = htu21_compute_dew_point(temperature,relative_humidity);

            variation += temperature - last_temperature;

            // Look for significant temperature variation
            if (  variation >= 0.5 ) {
                // Yes, so turn LED on.
                port_pin_set_output_level(LED_0_PIN, LED_0_ACTIVE);
                variation = 0;
                } else if ( variation <= -0.5 ) {
                // No, so turn LED off.
                port_pin_set_output_level(LED_0_PIN, LED_0_INACTIVE);
                variation = 0;
            }

            delay_ms(500);
            last_temperature = temperature;
            n++;
            if(n==50) n=0;
        }

        return 0;
}
```

Ordering Information

Description	Part Number
MEAS HTU21D XPLAINED PRO BOARD	DPP301A000

te.com/sensorsolutions

PRODUCT SHEET

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