HDC1010EVM User's Guide

User's Guide



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HDC1010EVM User's Guide

1 Introduction

The Texas Instruments HDC1010EVM evaluation module (EVM) enables designers to evaluate the operation and performance of the HDC1010 Relative Humidity and Temperature sensor.

The EVM contains one HDC1010 (See Table 1).

Table 1. Device and Package Configurations

DEVICE	IC	PACKAGE
U1	HDC1010YPAR	DSBGA - 8 pin (YPA0008)

The EVM hosts an MSP430F5528 microcontroller (μ C) as well as the HDC1010. The μ C is used to control the HDC1010 and communicate with a host PC through a USB port. The EVM is designed to be broken into two sections if desired. The sensor section can be separated from the μ C section so that the user can remotely locate the sensor from the μ C section.

2 Setup

This section describes the connectors on the EVM as well and how to properly connect, setup and use the HDC1010EVM.



Figure 1. HDC1010EVM

2.1 Input/Output Connector Description

2.1.1 J1 – 5x1 Header

This header is not populated and can be installed if the EVM is broken in 2 sections: PC interface and Sensor. This connector with its counterpart J2 allows the communication of the two sections through a 5-wire cable

J1.1	GND
J1.2	SDA
J1.3	SCL
J1.4	DRDYn
J1.5	VDD

2.1.2 J2 – 5x1 Header

This header is not populated and can be installed if the EVM is broken in 2 sections: PC interface and Sensor. This connector with its counterpart J1 allows the communication of the two sections through a 5-wire cable.

J2.1	GND
J2.2	SDA
J2.3	SCL
J2.4	DRDYn
J2.5	VDD

2.1.3 USB Type A Connector

This connector is used for communications with the PC and provides power for the EVM.

2.2 Hardware Setup

The HDC1010EVM power is supplied via the USB connector. The LDO (U4) converts the 5V from the USB to 3.3V used by the HDC1010 and the MSP430. The EVM may be directly inserted into a USB port on a PC or laptop, or may be connected to the latter using the appropriate USB cable.

The I2C address of the HDC1010 is set at EVM level at 1000000xb on the EVM. The I2C address has been set mounting the 0 Ω resistors R3 and R1 (refer to Figure 2).



Figure 2. HDC1010EVM : Sensor module

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In order to change the I2C address, remove the resistors R1 and R3 and populate the R2 and R4 with 0 Ω resistors (refer to Figure 3 and Figure 4)



Figure 3. HDC1010EVM: Layout Resistors for I2C Address Setting - Top



Figure 4. HDC1010EVM: Layout Resistors for I2C Address Setting - Bottom

Table 2. I2C Address

ADR1	ADR0	R1	R2	R3	R4	HDC1010 ADDRESS
0	0	Short	Open	Short	Open	1000000
0	1	Open	Short	Short	Open	1000001
1	0	Short	Open	Open	Short	1000010
1	1	Open	Short	Open	Short	1000011

In the table above, the EVM default configuration is in **bold**.

2.3 Software Setup

2.3.1 System Requirements

The Sensing Solutions GUI supports:

- 64-bit Windows 7
- 64-bit Windows XP

The current GUI does not support 32-bit Windows operating systems. The host machine is required for device configuration and data streaming. The following steps are necessary to prepare the EVM for the GUI:

- The GUI and EVM driver must be installed on the host.
- The EVM must be connected to a full speed USB port (USB 1.0 or above).



2.3.2 Sensing Solutions GUI and EVM Driver Installation

The Sensing Solutions GUI and EVM driver installer is packaged in a zip file. Follow these steps to install the software.

- 1. Download the software ZIP file from the EVM tool page
- 2. Extract the downloaded ZIP file
- 3. Run the included executable
- 4. Follow all directions from the installer



Figure 5. GUI Installer Welcome Page

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Setup



5. Read the license agreement and if you still wish to install the software, select "I accept the agreement" and click "Next" as shown in



Figure 6. GUI Installer License Agreement

6. Select the installation directory. If the user installing the software is not a system administrator a directory not with "Program Files" should be chosen instead of the default.



Figure 7. GUI Installer Installation Directory



7. Wait for all files to install



Figure 8. GUI Installer Copying Files

8. After the files have copied a device driver installer will start. If prompted about an unsigned driver, choose to install the driver anyways. If running Windows 8 or 8.1, the PC must be started in a "Safe" mode to install the unsigned driver.



Figure 9. EVM Driver Installer Welcome Page

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Setup

Setup

9. Wait for the driver to install

Device Driver Installation Wizard
The drivers are now installing
Please wait while the drivers install. This may take some time to complete.
< <u>B</u> ack <u>N</u> ext > Cancel

Figure 10. EVM Driver Installer In Progress

10. Click "Finish" after the driver has been installed



Figure 11. EVM Driver Installer Complete



11. Click "Finish" to complete the software installation



Figure 12. GUI Installer Complete

2.4 Operation

When the EVM is connected the host computer, the latter should automatically detect the device as an HDC1080EVM/HDC1000EVM.

Launch the GUI. A detailed description of the GUI operation is presented later in this document.



Setup

2.5 Reducing the SensorThermal Mass

The HDC1010EVM can be broken into 2 sections to isolate the thermal mass of the μ C from the HDC1010. Figure 13 shows the board perforations that allow the two sections to be broken apart.



Figure 13. HDC1010EVM : PC Interface and Sensor Module

The communication between the two modules is ensured through the connector J1 and J2 and a 5-wire cable. In this configuration the thermal mass of the EVM is dramatically reduced, improving the temperature measurements performances of the HDC1010. The cable connecting J1 to J2 must conform to I2C cable length constraints. When used in this configuration, the GUI can still be used to communicate with the EVM and collect data.

If the thermal mass of the sensor section is still excessive, the sensor section can be reduced by breaking it at the perforation shown in Figure 14. The PCB segment that hosts the HDC1010 is 5.5mm x 5mm.



Figure 14. HDC1010EVM : PC Interface and Smaller Sensor Module

Also in the case where the EVM is broken in 2 sections it is still possible to use the GUI (ensuring the connections between the modules) or alternatively it is possible to connect the sensor module to a custom micro-controller. (Refer to Figure 15).



Figure 15. HDC1010EVM : Pads for I2C and Supply of the Smaller Sensor Module



3 GUI Operation

The section describes how to use the GUI

3.1 Starting the GUI

Follow these steps to start the GUI:

- 1. Select the windows start menu
- 2. Select "All programs"
- 3. Select the "Texas Instruments" folder
- 4. Select the Sensing Solutions GUI
- 5. Click "Sensing Solutions GUI"
- 6. Splash screen will appear for at least two seconds.
 - · Slower PC's may show a blank splash screen without any texts for up to 20 seconds



Figure 16. GUI Splash Screen

7. After the splash screen is displayed the main window will open. Note: Only one instance of the GUI may be open at a time!

GUI Operation



GUI Operation

	OneUI Application	
MENU	Sensing Solutions EVM GUI	v1.0
ntroduction to Capac	itive Sensing	
apacitive sensing is a l e/rain detection and co	high-resolution, low-cost contactless sensing technique that can be applied to a variety of applications such as liquid level sensing, proximity sensing, gesture recog Illision avoidance.	nition,
he sensor in a capaciti proximity sensor or liq	ve sensing system is any conductor, such as copper on PCB, conductive ink or a piece of metal, allowing for low cost and highly flexible system design. This conduc uid level sensor depending on the use case.	ctor acts as
enefits of TI technol	ogy and the FDC2x14 and FDC2x12 Families	
 EMI resistant so Fast sensor exci Fast sample rate High capacitive High resolution: 	lution: Narrow band architecture eliminates unwanted noise and interferences enabling EMI-resistant proximity sensor and gesture recognition applications. Itation rate with wide frequency range: Allows sensing of all liquids including conductive ones such as detergent, soap, and ink and allows flexibility in sensor des E Easily enables sensing moving targets (e.g. gesture recognition). Sensing range: Large input range allows compensation of environmental variables such as temperature and humidity in addition to allowing remote sensing capab Allows far distance object sensing with a small, inexpensive conductive sensor.	ign. ilities.
ey benefits of Cap Sen	ising technology:	
Strong reliability	: Offers contactless sensing that eliminates mechanical wear.	
 Great flexibility: Low system cos High sensitivity: 	Sensor size and shape can adapt to system geometry. t: Uses low cost sensors, either a piece of metal already existing in the system or a small, two-layer copper on PCB or a pressed foil or a copper tape or a conductiv Sensitive to both conductive and non-conductive materials.	ve ink.
roximity Sensing		
apacitive sensing can voidance in industrial a	be used as a low-cost, flexible solution for several proximity sensing applications such as proximity wakeup in thermostats, appliances, and consumer goods; collision automotive doors; and kick sensors and keyless entry in automotive doors.	on

Figure 17. GUI Introduction Page

3.2 Connecting the EVM

Follow these steps to connect the EVM to the GUI:

- 1. Attach the EVM to the computer via the USB port.
- 2. The GUI always shows the connection status on the bottom left corner of the GUI
 - The initial release of this GUI does not support multiple GUI instances or multiple devices. To control multiple EVMs, virtual machines may be used or multiple PC's are required. Future releases will support multiple EVMs from a single instance of the GUI.

	OneUI Application	
MENU	Sensing Solutions EVM GUI	v1.0
Introduction to Cap	pacitive Sensing	
Capacitive sensing is ice/rain detection and	s a high-resolution, low-cost contactless sensing technique that can be applied to a variety of applications such as liquid level sensing, proximity sensing, gesture recogn d collision avoidance.	ition,
The sensor in a capa a proximity sensor or	acitive sensing system is any conductor, such as copper on PCB, conductive ink or a piece of metal, allowing for low cost and highly flexible system design. This conduct r liquid level sensor depending on the use case.	or acts as
Benefits of TI tech	nology and the FDC2x14 and FDC2x12 Families	
EMI resistant Fast sensor e Fast sample r High capaciti High resolutio Key benefits of Cap s Strong reliabi Great flexibili	solution: Narrow band architecture eliminates unwanted noise and interferences enabling EMI-resistant proximity sensor and gesture recognition applications. excitation rate with w rate: Easily enables de ve sensing range: La on: Allows far instance object enoung non domain interpendence Sensing tannology: Ility: Overs contactless sensing that eliminates mechanical wear. try densor size and shape can adapt to system a former/y.	gn. ities.
 Low system c High sensition 	st: Uses low cost sensors, either a piece of metal already existing in the system or a small, two-layer copper on PCB or a pressed foil or a copper tape or a conductive ty: Sensitive to both conductive and non-conductive materials.	e ink.
Proximity Sensing		
Caracitive sensing c voidance in industri	an be used as now-cost, flexible solution for several proximity sensing applications such as proximity wakeup in thermostats, appliances, and consumer goods; collision al and automotive doors; and kick sensors and keyless entry in automotive doors.	n
Key benefits of using	capactive sensing for proximity sensor applications are:	

Figure 18. GUI Disconnected From EVM

OneUI Application	_ 🗆 🗙
MENU Sensing Solutions EVM GUI	v1.0
Introduction to Capacitive Sensing	
Capacitive sensing is a high-resolution, low-cost contactless sensing technique that can be applied to a variety of applications such as liquid level sensing, proximity sensing ice/rain detection and collision avoidance.	j, gesture recognition,
The sensor in a capacitive sensing system is any conductor, such as copper on PCB, conductive ink or a piece of metal, allowing for low cost and highly flexible system design a proximity sensor or liquid level sensor depending on the use case.	gn. This conductor acts as
Benefits of TI technology and the FDC2x14 and FDC2x12 Families	
EMI resistant solution: Narrow band architecture eliminates unwanted noise and interferences enabling EMI-resistant proximity sensor and gesture recognition app Fast sensor excitation rate with w Fast sample rate: Easily enables we High capacitive sensing ratio sensing the sensing the sension rate were sensing that a sension rate were sension rate were sension rate were sensing that a sension rate were sension rate were sensing that a sension rate were sension rate were sensing that a sension rate were sensing to the sension rate were sen	lications. ty in sensor design. e sensing capabilities.
 Strong reliability: Grers contactless sensing that eliminates mechanical wear. Great flexibility: Grers contactless and shape can adapt to system or of metry. Low system cost: Uses low cost sensors, either a piece context already existing in the system or a small, two-layer copper on PCB or a pressed foil or a copper tap High sensitivity: Sensitive to both conductive and non-conductive materials. 	e or a conductive ink.
Proximity Sensing	
Caractive sensing can be used as prow-cost, flexible solution for several proximity sensing applications such as proximity wakeup in thermostats, appliances, and consume voidance in industrial and auto-otive doors; and kick sensors and keyless entry in automotive doors.	er goods; collision
Key benefits of using capacitive sensing for proximity sensor applications are:	
Connected SSP EVM connected - HDC10x0	Texas Instruments





3.3 Navigating the GUI

To navigate to different pages of the GUI follow these steps:

1. Click "Menu" in the upper left corner







2. Select the desired page from the menu shown on the left

0		OneUI Application -	. 🗆 🗙
	MENU	Sensing Solutions EVM GUI	1.0
0	Introduction	nsing	Â
	Device	lution, low-cost contactless sensing technique that can be applied to a variety of applications such as liquid level sensing, proximity sensing, gesture recognition, oidance.	
	EVM	g system is any conductor, such as copper on PCB, conductive ink or a piece of metal, allowing for low cost and highly flexible system design. This conductor act sensor depending on the use case.	s as
	Registers		
٥	Configuration	the FDC2x14 and FDC2x12 Families	
M	Data Streaming	arrow band architecture eliminates unwanted noise and interferences enabling EMI-resistant proximity sensor and gesture recognition applications. te with wide frequency range: Allows sensing of all liquids including conductive ones such as detergent, soap, and ink and allows flexibility in sensor design.	
1	Firmware	radies sensing moving largets (e.g. gesure recognition). range: Large input range allows compensation of environmental variables such as temperature and humidity in addition to allowing remote sensing capabilities. If distance object sensing with a small, inexpensive conductive sensor.	
		nology:	
		contactless sensing that eliminates mechanical wear.	
		we cost sensors, either a piece of metal already existing in the system or a small, two-layer copper on PCB or a pressed foil or a copper tape or a conductive ink. to both conductive and non-conductive materials.	
		as a low-cost, flexible solution for several proximity sensing applications such as proximity wakeup in thermostats, appliances, and consumer goods; collision notive doors; and kick sensors and keyless entry in automotive doors.	
		ensing for proximity sensor applications are:	+
•	Connected SSP EVM co	Dnnected - HDC10x0	MENTS

Figure 21. GUI Navigation Menu

3.4 Configuring the Device using Register Page

The register page allows users to control the device directly with the register values. The user may also use this page to read the currect register values on the device.

3.4.1 Automatically Updating GUI Register Values Using Auto-Read

Autoread will periodically request the register values on the device. Click the dropdown box next to "Auto Read" to select the update interval.



GUI Operation

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gisters																		
Auto Read Every 1 sec Off Every 1/4 sec Every 1/2 sec Every 1 sec Write Re Every 5 sec to Register Every 1 sec Register	LUpdate Mode: Immer	ilate 🔻																
Every 20 sec	Address	Current Value						1		В	ts					1	1	
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
EMPERATURE	0x00	0x6158	0	1	1	0	0	0	0	1	0	1	0	1	1	0	0	0
IUMIDITY	0x01	0x96f4	1	0	0	1	0	1	1	0	1	1	1	1	0	1	0	0
ONFIGURATION	0x02	0x1000	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ERIAL_ID_39_24	0xFB	0x00b0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
ERIAL_ID_23_8	0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
ERIAL_ID_7_0	0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
IANUFACTURER_ID	0xFE	0x5 <mark>44</mark> 9	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
EVICE_ID	0xFF	0x1050	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0

Figure 22. Selecting Auto-Read Interval on Register Page

3.4.2 Manually Updating Device Register Values

There are two methods to change register values: update the entire register value or change a single bit within the register. The recommended update mode is always "Immediate" and not "Deferred". To update register values, follow these steps.

1. Double-click the current value of the register that needs to be changed. The text will turn into an editable text box



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MENU	Sensing Solu	tions EVM GUI															v1	1.1
egisters																		
Auto Read Every 1 sec		inmodiate •																
Register	Address	Current Value								E	lits							
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HUMIDITY	0x01	0x9a68	1	0	0	1	1	0	1	0	0	1	1	0	1	0	0	0
CONFIGURATION	0x02	0x3000 I	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
SERIAL_ID_39_24	0xFB	0x00b0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
SERIAL_ID_23_8	0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
SERIAL_ID_7_0	0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
MANUFACTURER_ID	0xFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
	0xFF	0x1050	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0

- Figure 23. Selecting a Register's Current Value for Editting on Register Page
- 2. Type the new value in hexadecimal into the box and click enter. The text box changes to normal text and the GUI will send a command to the EVM to update the device register

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| s Current value | 15 | 14 | 13 | 12 | 11 | 10
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 | 1
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 | 0
 | 1 | 1 | 1 | 0 | 0
 | 0 |
| 0x99ec | 1 | 0 | 0 | 1 | 1 | 0
 | 0
 | 1
 | 1
 | 1
 | 1 | 0 | 1 | 1 | 0
 | 0 |
| 0x1 000 | 0 | 0 | 1 | 1 | 0 | 0
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| 0x00b0 | 0 | 0 | 0 | 0 | 0 | 0
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| 0xfa64 | 1 | 1 | 1 | 1 | 1 | 0
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| 0x6600 | 0 | 1 | 1 | 0 | 0 | 1
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| 0x5449 | 0 | 1 | 0 | 1 | 0 | 1
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 | 1 |
| 0x1050 | 0 | 0 | 0 | 1 | 0 | 0
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 | 0 | 1 | 0 | 0 | 0
 | 0 |
| | tode: Immediate | tode: Immediate | Current Value I 0x61b8 0 1 0x99ec 1 0 0x1þ00 0 0 0x00b0 0 0 0x1a64 1 1 0x6600 0 1 0x5449 0 1 | Itemediate Itemediate as Current Value 15 14 13 0x61b8 0 1 1 0x99ec 1 0 0 0x1p00 0 0 1 0x00b0 0 0 0 0xfa64 1 1 1 0x5449 0 1 0 0x1050 0 0 0 | Current Value Is 14 13 12 0x61b8 0 1 1 0 0x99ec 1 0 0 1 1 0x1b00 0 0 1 1 1 0x0b0 0 0 0 1 1 0x6600 0 1 1 1 1 0x5449 0 1 0 1 1 0x1050 0 0 0 1 1 | Solution Image: Solution <thimage: solution<="" th=""> Image: Solution<td>Solution Solution Solution</td><td>Solution Isolution <thisolution< th=""> Isolution <thisolution< th=""> <thisolution< th=""> <thiso< td=""><td>Solution Current Value III 14 13 12 11 10 9 8 0x61b8 0 1 1 0 0 0 1 10 9 8 0x61b8 0 1 1 0 0 0 1 1 0 0 1 0x99ec 1 0 0 1 1 0 0 0 1 0x1b00 0 0 0 1 1 0<td>Mode: Image: Image</td><td>Solution Current Value Solution Solution</td><td>Mode: Image: Image</td><td>Mode: Image: Image</td><td>Mode: Image: Stress of the stres</td><td>Mode: Image: Image</td><td>Model Model <th< td=""></th<></td></td></thiso<></thisolution<></thisolution<></thisolution<></td></thimage:> | Solution Solution | Solution Isolution Isolution <thisolution< th=""> Isolution <thisolution< th=""> <thisolution< th=""> <thiso< td=""><td>Solution Current Value III 14 13 12 11 10 9 8 0x61b8 0 1 1 0 0 0 1 10 9 8 0x61b8 0 1 1 0 0 0 1 1 0 0 1 0x99ec 1 0 0 1 1 0 0 0 1 0x1b00 0 0 0 1 1 0<td>Mode: Image: Image</td><td>Solution Current Value Solution Solution</td><td>Mode: Image: Image</td><td>Mode: Image: Image</td><td>Mode: Image: Stress of the stres</td><td>Mode: Image: Image</td><td>Model Model <th< td=""></th<></td></td></thiso<></thisolution<></thisolution<></thisolution<> | Solution Current Value III 14 13 12 11 10 9 8 0x61b8 0 1 1 0 0 0 1 10 9 8 0x61b8 0 1 1 0 0 0 1 1 0 0 1 0x99ec 1 0 0 1 1 0 0 0 1 0x1b00 0 0 0 1 1 0 <td>Mode: Image: Image</td> <td>Solution Current Value Solution Solution</td> <td>Mode: Image: Image</td> <td>Mode: Image: Image</td> <td>Mode: Image: Stress of the stres</td> <td>Mode: Image: Image</td> <td>Model Model <th< td=""></th<></td> | Mode: Image: Image | Solution Current Value Solution Solution | Mode: Image: Image | Mode: Image: Image | Mode: Image: Stress of the stres | Mode: Image: Image | Model Model <th< td=""></th<> |





GUI Operation

agisters																		
Auto Read Every 1 sec •	± ±																	
Write Register	Address	Current Value								В	its							
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
EMPERATURE	0x00	0x6154	0	1	1	0	0	0	0	1	0	1	0	1	0	1	0	C
UMIDITY	0x01	0x99ac	1	0	0	1	1	0	0	1	1	0	1	0	1	1	0	(
ONFIGURATION	0x02	0x1000	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	C
ERIAL_ID_39_24	0xFB	0x00b0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	C
ERIAL_ID_23_8	0xFC	0xfa64	1	1	1	1	1	0	-1	0	0	1	1	0	0	1	0	C
ERIAL_ID_7_0	0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	C
IANUFACTURER_ID	OXFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
	OVEE	0x1050	0	0	0		0	0	0	0	0	1	0	1	0	0	0	c

Figure 25. Register Value Updated After Changing Value on Register Page

To change individual bit values rather that entire register values follow these steps.

1. Hover the mouse over the desired bit to change

				0	neUI Ar	oplicati	on												
MENU	Sensin	g Solution	s EVM GUI															v	1.1
Registers																			
Auto Read Every	1 sec 🔹 🛓 📩	ate Mode: Immed	liate ▼																
Register		Address	Current Value								В	its							
				15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TEMPERATURE		0x00	0x60e0	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0
HUMIDITY		0x01	0x9918	1	0	0	1	1	0	0	1	0	0	0	1	1	0	0	0
CONFIGURATION		0x02	0x1000	0	0	9	1	0	0	0	0	0	0	0	0	0	0	0	0
SERIAL_ID_39_24		0xFB	0x00b0	0	0	8	0	0	0	0	0	1	0	1	1	0	0	0	0
SERIAL_ID_23_8		0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
SERIAL_ID_7_0		0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
MANUFACTURER_	ĪD	OXFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
DEVICE_ID		0xFF	0x1050	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0



2. Double-click the bit to toggle its value and the register's current value will update automatically

			0	neUI Ap	plicati	on											-	
MENU	Sensing Solution	s EVM GUI															v	1.1
legisters																		
Auto Read Every 1 sec	• 1	diate 🔻																
Register	Address	Current Value	1							B	its							
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TEMPERATURE	0x00	0x612c	0	1	1	0	0	0	0	1	0	0	1	0	1	1	0	0
HUMIDITY	0x01	0x9958	1	0	0	1	1	0	0	1	0	1	0	1	1	0	0	0
CONFIGURATION	0x02	0x3000	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
SERIAL_ID_39_24	0xFB	0x00b0	0	0	8	0	0	0	0	0	1	0	1	1	0	0	0	0
SERIAL_ID_23_8	0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
SERIAL_ID_7_0	0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	C
MANUFACTURER_ID	0xFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
	0xFF	0x1050	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0

Figure 27. Toggling Register Bit Value on Register Page

3.4.3 Reading Register Values without Auto-Read

To read register values follow these steps.

1. Select the register to update by clicking any column of the register row in the table



GUI Operation

MENU	Sensi	ng Solution	s EVM GUI	0	neUI Ap	oplicati	on											v	ם 1.1
egisters																			
Auto Read Ever	y 1 sec 🔻]																	
Write Register Register	9 Read Register Upd	ate Mode: Immed	Current Value	1							В	its							_
				15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
EMPERATURE		0x00	0x6194	0	1	1	0	0	0	0	1	1	0	0	1	0	1	0	0
IUMIDITY		0x01	0x99ec	1	0	0	1	1	0	0	1	1	1	1	0	1	1	0	0
ONFIGURATION	1	0x02	0x3000	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
ERIAL_ID_39_24	E	0xFB	0x00b0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
ERIAL_ID_23_8		0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
ERIAL_ID_7_0		0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
	LID	0xFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
DEVICE ID		0xFF	0x1050	0	0	0	4	0	0	0	0	0	1	0	4	0	0	0	0

2. Click the "Read Register" button to update the selected register's current value and bit values in the table

			0	neUI A	oplicati	on											-	
MENU	Sensing Solution	s EVM GUI															v	1.1
egisters																		
Auto Read Every 1 sec		diato •																
Register	Address	Current Value	1							В	its							
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TEMPERATURE	0x00	0x619c	0	1	1	0	0	0	0	1	1	0	0	1	1	1	0	0
HUMIDITY	0x01	0x9a68	1	0	0	1	1	0	1	0	0	1	1	0	1	0	0	0
CONFIGURATION	0x02	0x3000	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
SERIAL_ID_39_24	0xFB	0x00b0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
SERIAL_ID_23_8	0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
SERIAL_ID_7_0	0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
MANUFACTURER_ID	0xFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
DEVICE_ID	0xFF	0x1050	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0



3.4.4 Saving Device Configuration

To save the current register settings of the device follow these steps.

1. Click the button immediately right to the "Auto-Read" selection dropdown

MENU Sensing Solutions EVM GUI Registers Auto Read Every 1 sec * Write Register • Read Register Update Mode Immediate Register Address Current Value • E TEMPERATURE 0x00 0x5190 0 1 1 0 0 0 1	Bits					V	1.1
Registers Auto Read Every 1 sec	Bits						
Auto Read Every 1 sec Write Register Y Read Register Update Mode: Immediate Register Address Current Value 15 14 13 12 11 10 9 8 TEMPERATURE 0x00 0x5190 0 1 1 0 0 0 1	Bits						
Register Address Current Value E E 15 14 13 12 11 10 9 8 TEMPERATURE 0x00 0x6190 0 1 1 0 0 0 1	Bits						
TEMPERATURE 0x00 0x6190 0 1 1 0 0 0 1 1							
TEMPERATURE 0x00 0x6190 0 1 1 0 0 0 1	7 6	5 5	4	3	2	1	0
	1 0	0 0	1	0	0	0	0
HUMIDITY 0x01 0x992c 1 0 0 1 1 0 0 1	0 0) 1	0	1	1	0	0
CONFIGURATION 0x02 0x3000 0 0 1 1 0 0 0 0	0 0	0 0	0	0	0	0	0
SERIAL_ID_39_24 0xFB 0x00b0 0 0 0 0 0 0 0 0 0 0 0 0	1 0) 1	1	0	0	0	0
SERIAL_ID_23_8 0xFC 0xfa64 1 1 1 1 1 0 1 0	0 1	1	0	0	1	0	0
SERIAL_ID_7_0 0xFD 0x6600 0 1 1 0 0 1 1 0	0 0	0 0	0	0	0	0	0
MANUFACTURER_ID 0xFE 0x5449 0 1 0 1 0 1 0 0	0 1	1 0	0	1	0	0	1
DEVICE_ID 0xFF 0x1050 0 0 0 1 0 0 0 0 0 0	0 1	1 0	1	0	0	0	0

Figure 30. Save Register Values to File on Register Page



GUI Operation

2. Choose a JSON file name and the directory to save it within. Then click "Save"

0			Save As				×
ح 🛞 🟵	▶ This PC → Data (E:) → Device Configurations				~ C	Search Device Configurations	٩
Organize 🔻 New	v folder						0
쑦 Favorites	Name	Date modified	Туре	Size			
答 OneDrive			No items ma	itch your search.			
🤞 Homegroup							
19 This PC							
👊 Network							
File <u>n</u> ame:	registers.json						~
Save as <u>t</u> ype:	JSON File						~
Aide Folders						Save Cancel	

Figure 31. Choosing a JSON File Name to Save Register Values

3.4.5 Loading Previously Saved Device Configuration

To load previously saved register settings from a JSON file follow these steps.

1. Click the button furthest right from the "Auto-Read" selection dropdown



27

			0	neUI A	oplicati	on											-	. 🗆 >
E MENU Sensi	ng Solution	s EVM GUI															v	1.1
Registers																		
Auto Read Every 1 sec 🔻 🛓 🛓)																	
Vite Register 7 Read Register Upd	ate Mode: Immed	liate 🔻																
Register	Address	Current Value								В	its							
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
TEMPERATURE	0x00	0x61a0	0	1	1	0	0	0	0	1	1	0	1	0	0	0	0	0
HUMIDITY	0x01	0x98b0	1	0	0	1	1	0	0	0	1	0	1	1	0	0	0	0
CONFIGURATION	0x02	0x3000	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
SERIAL_ID_39_24	0xFB	0x00b0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0
SERIAL_ID_23_8	0xFC	0xfa64	1	1	1	1	1	0	1	0	0	1	1	0	0	1	0	0
SERIAL_ID_7_0	0xFD	0x6600	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0
MANUFACTURER_ID	0xFE	0x5449	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1
DEVICE_ID	0xFF	0x1050	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0
														_Dia 1	TEXA	c In		
Connected Registers refreshed.															IEXA	S INS	STRU	MENT
Figure 60 1 s	a dina n Da	audamahu Or		De			/ - Iv -						! -		D	_		

2. Select the JSON file with the desired settings and click "Open"

0			Open			×
⊙ ⇒ ↑ ↓	This PC → Data (E:) → Device Configurations	•			✓ ♥ Search Device Configurations	P
Organize 🔻 New fo	lder					0
☆ Favorites	Name	Date modified	Туре	Size		
ConeDrive	I registers.json	6/11/2015 7:11 PM	JSON File	2 KB		
Chebrive						
🤣 Homegroup						
🖳 This PC						
🗊 Network						
- Network						
File	name: registers.json				V JSON File	~
					Qpen Cancel	





GUI Operation

3.5 Configuring the Device using Configuration Page

The Sensing Solutions GUI is capable on configuring the device more intuitively than the direct register values. For more information about configuring the HDC1010 please reference the device datasheet.

MENU Sensing Solutions EVM GUI	v1.1
Configuration	~
Temperature Measurement Resolution	
 ● 14 bit ○ 11 bit 	
Humidity Measurement Resolution	
9 14 bit	
○ 11 Dit	
© 8 bit	
Heater Enabled	
Disabled	
© Enabled	
Mode of Acquisition	
Temperature or Humidity is acquired	
Temperature and Humidity are acquired in sequence, Temperature first.	
Connected Data streaming in progress	EXAS INSTRUMENTS

Figure 34. HDC1010 GUI Configuration Page



3.6 Streaming Measurement Data

The Sensing Solutions GUI and EVM provide a tool to capture measurement data at rates up to 500Hz. The section describes how to use the data measurement tools from the "Data Streaming" page accessible from the GUI menu.

3.6.1 Choosing Graph Units and Visible Channels

Select the drop down menu on top of the y-axis to choose the units of the graph. Available options include: Temperature and Humidity, and Raw Code.

0					OneUI Application					- 🗆 🗙
≡ MENU		Sensing S	olutions EVM	I GUI						v1.1
Data Streaming:	Start (S)						Sho	w Graph Configu	ration (C) Sho	ow Statistics (I)
Temperature and Temperature and Raw Code	Humidity Humidity	Show: TEMPERATI	JRE_CELCIUS ☑ 1	RELATIVE_HUMIDI	TY_PERCENT 🖉		с	ilick to Select Log F	ile: 🛓 not	logging data
0.9										
0.8										
0.7										
0.6										
0.5										
0.4										
0.3										
0.2										
0.1										
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	RATURE_CELCIUS	V RELATIVE_HUMIDITY	PERCENT						898	1024 Range: 128
	Desister a								Truce In	
Connected	Registers r	erresneo.							TEXAS IN	STRUMENTS

Figure 35. Selecting the Measurement Units for the Data Streaming Graph

To select which measurements are displayed in the graph, check or uncheck the temperature and relative humidity boxes shown next to the graph units. Selecting or not selecting the data types only affects the graph and not the data logged to a file. If a data type is not enabled in the Configuration page it will not appear on the Data Streaming page.



GUI Operation

www.ti.com



Figure 36. Data Streaming Graph Showing Only Relative Humidity Percent







3.6.2 Logging data to a file

Follow these steps to log measurement data to a file.

1. Click the button in the upper right under next to "Click to Select Log File"



Figure 38. Select Log File Button on Data Streaming Page



GUI Operation

www.ti.com

2. Select a file name and directory to save the data to and then click the "Save" button

0			Save As					×
🛞 🏵 🔻 🕇 🌗	▶ This PC ▶ Data (E:) ▶ Data				~ C	Search Data		P
Organize 🔻 Ne	w folder						•	0
 Favorites Desktop Downloads Recent places Development OneDrive Homegroup This PC Apple iPhone Desktop Documents Downloads Music Pictures Videos Local Disk (C:) Data (E:) 	Name	Date modified	Type No ite	Size				
File <u>n</u> ame:	data.csv							~
Save as <u>t</u> ype:	Microsoft Excel Comma Separated Values File							~
Hide Folders						Save	Cance	

Figure 39. Selecting the Log File for Data Streaming

3.6.3 Setting the vertical axis scale and sampling rate

To set the vertical axis scale or change the sampling rate follow these steps.

1. Click the "Show Graph Configuration" button



GUI Operation



Figure 40. Show Graph Configuration Button on Data Streaming Page

- 2. The sampling rate can be adjusted in the "Sampling Rate" table.
 - Note that the GUI sampling rate affects only the graph and logging rate but not the actual device sampling rate

ta Streaming: Start (S)		Hide Graph	Configuration	(C) Sł	now Sta	tistics
mperature and Humidity Show: TEMPERATURE_CELCIUS RELATIVE_HUMIDITY_PERCENT	Graph Configu	ration				
80 -		Sampling Rate				
75	Item	Time (ms)	Rate (Hz)			
70	GUI Graphing	100d I 🌻] 1			
65	Device	1000	1			
60		Vertical S	caling			
50		Manual			Autos	cale
45	Mir	N	lax	Enable	View E	Juffer
40	0	10	0			
25		Buffer Settings				
20	Item	Samples T	ime (s)			
20	Update	1024	1024			
5 10 15 20 25	Current	1024	1024			
V IERFERAIURE_CELCIUS 🚫 RELATIVE_MUNIDITY_FERCENT				898	Danna 12	0
					mangle, 12	

Figure 41. Setting the Data Streaming Sample Rate to 1 Second



GUI Operation

3. The vertical scaling can be automatically updated or manually controlled by selecting either checkboxes in the "Vertical Scaling" table



Figure 42. Manually Setting the Vertical Scale on Data Streaming Graph



3.6.4 Starting and Stopping Measurement Data Acquisition

To start data streaming click the "Start" button.

0				One	UI Application			- 🗆 🗙						
≡ MENU	Sen	sing Solutio	ns EVM GUI	Û.						v1.1				
Data Streaming:	Start (S)						Sh	ow Graph Configu	ration (C) Show	w Statistics (I)				
Temperature and	Humidity	MPERATURE_CE	LCIUS 🗹 RELATI	VE_HUMIDITY_P	ERCENT 🗹		(Click to Select Log F	ile: 🛓 not :	logging data				
1.0 7														
0.9														
0.8														
0.7														
0.6														
0.5														
0.4														
0.3														
0.2														
0.1														
0.0	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.8	0.9	1.0				
N TEMPE	RATURE_CELCIUS 😞 RELATIV	E_HUMIDITY_PERCENT												
0									R	ange: 128				
Connected	Registers refreshed.							-	Texas In	STRUMENTS				

Figure 43. Starting Data Acquisition on Data Streaming Graph







GUI Operation

To stop data streaming click the "Stop" button.



Figure 45. Stopping Data Acquisition on Data Streaming Graph

3.6.5 Displaying Measurement Data Statistics

Click the "Show Statistics" button to view the measurement statistics.



GUI Operation











3.6.6 Navigating the GUI's Data Buffer

After stopping the data stream, the number of data samples displayed can be selected by moving the dual slider under the graph.



Figure 48. Moving the Data Graph Sample View





Figure 49. Viewing the Entire Buffer on Data Graph

3.7 Updating the EVM Firmware

To upload new firmware to the EVM, navigate to the "Firmware" page from the GUI menu and follow these steps.

1. Click the button to select a TI-TXT firmware file



GUI Operation

9		OneUI Application	- C ×
E MENU	Sensing Solutions EVM GUI		v1.0
Firmware Upgrade			
Select TI-TXT firmware File:			
Connected Data stream	ng stopped		TEXAS INSTRUMENTS

Figure 50. Select TI-TXT File Button on Firmware Upload Page

2. Select the firmware file and click "Open"

anize New folder Favorites Name Date modified Type Size Desktop Downloads Recent places Development ConeDrive Homegroup This PC Apple iPhone Desktop Downloads Downloads	🕘 🔹 🕇 📕 🕨	This PC → Local Disk (C:) → Program Files ((x86) → Texas Instruments →	Sensing Solution	is GUI-1.0 ≯	EVM Firmware	~ C	Search EVM Firmware	
Favorites Name Date modified Type Size Desktop FDC2x14_EVM_Firmware.bt 6/11/2015 3:34 PM TXT File 101 KB Downloads Recent places Development 101 KB Development	ganize 🔻 New fo	lder							
Desktop Downloads Recent places Development NoneDrive Homegroup This PC Apple iPhone Desktop Downloads Posttop Downloads	Favorites	Name	Date modified	Туре	Size				
	Desktop Downloads Recent places Development OneDrive Homegroup This PC Apple iPhone besktop Documents Documents Documents Documents Documents	FDC2x14_EVM_Firmware.txt	6/11/2015 3:34 PM	TXT File		101 KB			
	Network								
l Network	File	name: FDC2x14_EVM_Firmware.bt					~	Text Document	

Figure 51. Selecting TI-TXT Firmware File for Upload to EVM



3. Click the "Upload Firmware" button

0	OneUI Application	- 🗆 🗙
■ MENU	Sensing Solutions EVM GUI	v1.0
Firmware Upgrade		
Select TI-TXT firmware File:	C:\Program Files (x86)\Texas Instruments\Sensing Solutions GUI-1.0\EVM Firmware\FDC2x14_EVM_Firmware.txt	
Upload Firmware		
£		
Connected Data streamin	ng stopped TEXAS INST	TRUMENTS

Figure 52. Upload Firmware Button on Firmware Upload Page

4. Wait for the firmware to upload. Do NOT disconnect the EVM from the PC at this time! Also note that the GUI will disconnect from the EVM. The upload process should not take more than one minute.

OneUI Application – 🗆 🗙
■ MENU Sensing Solutions EVM GUI v1.0
Firmware Upgrade
Select TI-TXT firmware File: 🛳 C:\Program Files (x86)\Texas Instruments\Sensing Solutions GUI-1.0\EVM Firmware\FDC2x14_EVM_Firmware.txt
Wait for upload to complete
Uploading firmware: Please do NOT disconnect the EVMI
Not connected SSP EVM disconnected
Figure 53. Firmware Upload in Progress



GUI Operation

0	OneUI Application	- 🗆 X
E MENU	Sensing Solutions EVM GUI	v1.0
Firmware Upgrade		
Select TI-TXT firmware File:	C:\Program Files (x86)\Texas Instruments\Sensing Solutions GUI-1.0\EVM Firmware\FDC2x14_EVM_Firmware.txt	
	Successi	
Connected SSP EVM co	onnected - FDC2214 TEXAS INS	TRUMENTS

Figure 54. Firmware Upload Success



4 Board Layout

Figure 55 and Figure 56 show the board layout for the HDC1010EVM.



Figure 55. Top Layer Routing



Figure 56. Bottom Layer Routing



Schematic

5 Schematic





6 HDC1010EVM Bill of Materials

COUNT	REF DES	DESCRIPTION	FOOTPRINT	PART NUMBER
1	C1	CAP, CERM, 0.1µF, 10V, ±10%, X5R, 0201	0201	CL03A104KP3NNNC
1	C2	CAP, CERM, 10µF, 10V. ±20%, X5R, 0603 0603		C1608X5R1A106M080A C
4	C3, C5, C11, C19	CAP, CERM, 0.1µF, 16V, ±5%, X7R, 0402	0402	GRM155R71C104JA88D
1	C4	CAP, CERM, 0.01µF, 50V, ±5%, C0G/NP0, 0603		CGA3E2C0G1H103J080 AA
1	C6	CAP, CERM, 0.22uF, 16V, ±10%, X7R, 0402	0402	GRM155R71C224KA12D
1	C7	CAP, CERM, 2200pF, 50V, ±10%, X7R, 0603 0603		C0603X222K5RACTU
2	C8, C9	CAP, CERM, 18pF, 100V, ±5%, C0G/NP0, 0603		GRM1885C2A180JA01D
1	C10	CAP, CERM, 0.22µF, 25V, ±10%, X5R, 0603	0603	06033D224KAT2A
1	C15	CAP, CERM, 2.2µF, 10V, ±10%, X5R, 0603	0603	C0603C225K8PACTU
1	C17	CAP, CERM, 0.47µF, 10V, ±10%, X7R, 0603	CAP, CERM, 0.47µF, 10V, ±10%, X7R, 0603 0603 0	
1	D1	GREEN LED, 1.7x0.65x0.8mm 0603 L		LG L29K-G2J1-24-Z
1	D2	SUPER RED LED, 1.6x0.60x0.8mm	0603	SML-LX0603SRW-TR
1	D21	Diode, Zener, 5.6V, 500mW, SOD-123	SOD-123	MMSZ5232B-7-F
2	J1, J2	Header, TH, 100mil, 5x1, Gold plated, 230 mil above insulator	-	TSW-105-07-G-S
1	J3	Connector, USB Type A, 4POS R/A, SMD - 4		48037-2200
1	L1	INDUCTOR POWER 10µH .45A SMD VLS201610		VLS201610ET-100M
2	R1, R3	RES, 0Ω, 5%, 0.05W, 0201 0201M I		ERJ-1GE0R00C
2	R2, R4	RES, 0Ω, 5%, 0.05W, 0201 0201M		ERJ-1GE0R00C
1	R5	RES, 33kΩ, 5%, 0.063W, 0402 0402 C		CRCW040233K0JNED
2	R6, R7	RES, 1kΩ, 5%, 0.063W, 0402	0402	CRCW04021K00JNED
2	R8, R9	RES, 33Ω, 5%, 0.063W, 0402	0402	CRCW040233R0JNED
3	R10, R11, R12	RES, 1.5kΩ, 5%, 0.063W, 0402 0402		CRCW04021K50JNED
1	R20	RES, 1MΩ 5%, 0.063W, 0402	0402	RC0402FR-071ML
1	R40	RES, 1.50kΩ, 1%, 0.063W, 0402 0402		CRCW04021K50FKED
1	U1	HDC1010 – Low Power, High Accuracy Digital YPA0008 Humidity Sensor with Temperature Sensor		HDC1010
1	U2	4-Channels ESD-Protection Array for High- Speed Data Interfaces DRY0006A		TPD4E004DRY
1	U3	MSP430F5528 Mixed Signal micro-controller RGC0064		MSP430F5528IRGC
1	U4	Micropower 150 mA Low-Noise Ultra Low- Dropout Regulator, 5-pin SOT-23, Pb-Free MF05A LF		LP2985AIM5-3.3/NOPB
1	Y1	CRYSTAL 24.000MHZ, 18pF, SMD	ABMM	ABMM-24.000MHZ-B2-T

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