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The FDC1004 Evaluation Module (EVM) enables the user to evaluate the FDC1004. The EVM is a USB device used with a host computer and accessed using the Graphical User Interface (GUI) software.

To quickly get started with the FDC1004 GUI, follow the steps below to load and configure a device.
Chapter 2
SNAU165—August 2014

Evaluation Module

2.1 Set Up Requirements

- The FDC1004 GUI and drivers must be installed on the host PC (download the software from TI website)
- The USB port of the EVM must be connected to the host PC.

2.2 Loading and Running

1. Plug the EVM into the host computer. The host computer should automatically detect the device as FDC1004EVM.
2. Launch the GUI. It automatically reads all the configuration registers, and begins streaming data of the 4 channels.
Figure 2-1. Streaming Section
2.3 Reloading the Device

If the EVM is disconnected from the host at any time, reconnect the device and the GUI will automatically discover and re-establish the streaming abilities with the device.

2.4 Configuring the Device Manually

1. The GUI puts the device in streaming mode by default. To configure the internal registers of the FDC1004 the streaming of the data must be stopped. Click on “Stop” in the Streaming Section to stop streaming.

![Stop Streaming](image.png)

**Figure 2-2. Stop Streaming**

2. Click on the “Configuration Section” icon in the main window toolbar.

![Configuration Section Icon](image.png)

**Figure 2-3. Configuration Section Icon**

3. Select the parameter to change. Changes are applied immediately.
Figure 2-4. Configuration Section
2.5 Saving Device Configuration
   1. Click on the "Save" icon in the toolbar.

   ![Figure 2-5. Save Icon](image)

   2. Type a name for the file.

2.6 Configuring the Device with Configuration File Defaults
   1. To configure the FDC1004 with a configuration file the streaming must be stopped.
   2. Click on the "Open" icon in the toolbar.

   ![Figure 2-6. Open Icon](image)

   3. Select the configuration file and press open.
   After the configuration file is loaded, the values are written once to all supported registers. To restore
default values (values load at power on of the EVM), click on "Restore from Defaults".

   ![Figure 2-7. Restore Defaults](image)
Capacitive Sensing GUI Overview

The capacitive-sensing GUI provides graphical configuration and streaming support for the FDC1004. The GUI package includes drivers for use with the FDC1004 Evaluation Modules (EVM). The EVM provides a device abstraction layer for the GUI to communicate with the FDC1004 through I2c, and includes other extended functionalities.

3.1 Host Platform Requirements
The FDC1004EVM GUI supports:
• 32-bit and 64-bit Windows 7
• 32-bit and 64-bit Windows XP
The host machine is required for device configuration and data streaming.

3.2 EVM Information
The TI FDC1004 EVM allows the GUI to:
• Configure register data through I2C (SCL, SDA)
• Stream register data through I2C

3.3 Hardware Setup
Below are the steps which are necessary to prepare the EVM for the GUI:
• The GUI must be installed on the host.
• The EVM driver must be installed on the host.
• The EVM must be connected to a full speed USB port (1.0 or above).

3.4 Icon Toolbar
The icon toolbar contains various icons which navigate between sections and perform various functions.

![Figure 3-1. Icon Toolbar](image)

**Table 3-1. Icon Toolbar**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection Information</td>
<td>Indicates whether an EVM is connected to the PC, and if so, provides details of the connected device.</td>
<td>EVM is connected:</td>
</tr>
</tbody>
</table>
### Table 3-1. Icon Toolbar (continued)

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Icon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>Opens saved register settings and defaults</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td>Save</td>
<td>Saves all current register settings and defaults</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td>Register Settings</td>
<td>Shows Register Settings Section</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td>Configuration</td>
<td>Shows Configuration Section</td>
<td><img src="image" alt="Icon" /></td>
</tr>
<tr>
<td>Streaming</td>
<td>Shows Streaming Section</td>
<td><img src="image" alt="Icon" /></td>
</tr>
</tbody>
</table>

#### 3.5 Connecting and Disconnecting

Device discovery, connection, and disconnection are performed automatically.

#### 3.6 General Configuration

In the configuration section, all registers of the device can be accessed. To access this section, streaming must be stopped.
Figure 3-2. Configuration Section
In the configuration window, select the parameter to change. Changes are applied immediately. Press “Read All” to refresh all configuration, status, and data. Press “Restore Defaults” to write values from the default column (if they exist) to the current register value.

3.7 Register Settings

In the register settings section, all registers of the device can be accessed. To read/write registers, streaming must first be stopped by pressing the "Stop" button.
Figure 3-3. Register Settings

<table>
<thead>
<tr>
<th>Register Name</th>
<th>Address</th>
<th>Dir</th>
<th>Default</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAS1 MSB</td>
<td>0x00</td>
<td>R</td>
<td></td>
<td>0x25F9</td>
</tr>
<tr>
<td>MEAS1 LSB</td>
<td>0x01</td>
<td>R</td>
<td></td>
<td>0x8200</td>
</tr>
<tr>
<td>MEAS2 MSB</td>
<td>0x02</td>
<td>R</td>
<td></td>
<td>0xFF25</td>
</tr>
<tr>
<td>MEAS2 LSB</td>
<td>0x03</td>
<td>R</td>
<td></td>
<td>0xCA00</td>
</tr>
<tr>
<td>MEAS3 MSB</td>
<td>0x04</td>
<td>R</td>
<td></td>
<td>0xFFF3</td>
</tr>
<tr>
<td>MEAS3 LSB</td>
<td>0x05</td>
<td>R</td>
<td></td>
<td>0xE800</td>
</tr>
<tr>
<td>MEAS4 MSB</td>
<td>0x06</td>
<td>R</td>
<td></td>
<td>0x27D0</td>
</tr>
<tr>
<td>MEAS4 LSB</td>
<td>0x07</td>
<td>R</td>
<td></td>
<td>0x5500</td>
</tr>
<tr>
<td>MEAS1 Configuration</td>
<td>0x08</td>
<td>RW</td>
<td></td>
<td>0xC00</td>
</tr>
<tr>
<td>MEAS2 Configuration</td>
<td>0x09</td>
<td>RW</td>
<td></td>
<td>0xC00</td>
</tr>
<tr>
<td>MEAS3 Configuration</td>
<td>0x0A</td>
<td>RW</td>
<td></td>
<td>0xC00</td>
</tr>
<tr>
<td>MEAS4 Configuration</td>
<td>0x0B</td>
<td>RW</td>
<td></td>
<td>0x7C00</td>
</tr>
<tr>
<td>CDC Configuration</td>
<td>0x0C</td>
<td>RW</td>
<td></td>
<td>0x0DFC</td>
</tr>
<tr>
<td>Offset Calibration CH1</td>
<td>0x0D</td>
<td>RW</td>
<td></td>
<td>0x0000</td>
</tr>
<tr>
<td>Offset Calibration CH2</td>
<td>0x0E</td>
<td>RW</td>
<td></td>
<td>0x0000</td>
</tr>
<tr>
<td>Offset Calibration CH3</td>
<td>0x0F</td>
<td>RW</td>
<td></td>
<td>0x0000</td>
</tr>
<tr>
<td>Offset Calibration CH4</td>
<td>0x10</td>
<td>RW</td>
<td></td>
<td>0x0000</td>
</tr>
<tr>
<td>Gain Calibration CH1</td>
<td>0x11</td>
<td>RW</td>
<td></td>
<td>0x8000</td>
</tr>
<tr>
<td>Gain Calibration CH2</td>
<td>0x12</td>
<td>RW</td>
<td></td>
<td>0x4000</td>
</tr>
<tr>
<td>Gain Calibration CH3</td>
<td>0x13</td>
<td>RW</td>
<td></td>
<td>0x4000</td>
</tr>
<tr>
<td>Gain Calibration CH4</td>
<td>0x14</td>
<td>RW</td>
<td></td>
<td>0x8000</td>
</tr>
<tr>
<td>Manufacturer ID</td>
<td>0xFE</td>
<td>R</td>
<td></td>
<td>0x4449</td>
</tr>
<tr>
<td>Device ID</td>
<td>0xFF</td>
<td>R</td>
<td></td>
<td>0x1004</td>
</tr>
</tbody>
</table>
Double-click on a register in the table to read/write. If a register is read only (indicated by a “R” in the Dir column), the selected register is read immediately and the table value updated. If the register is read/write (indicated by a “RW” in the Dir column), a dialog pops up and the user can choose a new register value. If the value is not changed, it will default to a read.

![Read/Write Register Dialog](image)

**Figure 3-4. Read/Write Register Dialog**

Press “Read All” to refresh all configuration, status, and data.
Press “Restore Defaults” to write values from the default column (if they exist) to the current register value.

3.8 Data Streaming
Data is streamed from the EVM to the GUI when the “Start” button is pressed. The sampling rate of the EVM and the number of samples to plot can be configured.

![Streaming Configuration](image)

**Figure 3-5. Streaming Configuration**

The sampling rate can only be set when streaming is stopped. The max sample rate supported by the streaming is 100S/s.

3.9 Average, Point, Min, Max Values
Average is the default display type. To toggle between sample point, min, and max values, right-click the display.

<table>
<thead>
<tr>
<th>Display Style</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>The average value of all data points currently in the plot</td>
</tr>
<tr>
<td>Point</td>
<td>The newest data point currently in the plot</td>
</tr>
<tr>
<td>Min</td>
<td>The minimum data point value currently in the plot</td>
</tr>
<tr>
<td>Max</td>
<td>The maximum data point value currently in the plot</td>
</tr>
</tbody>
</table>

A larger number of samples results in a larger averaging window.
3.10 Zooming and Scaling

Plots are interactive. Zooming options are available by right-clicking the plot and selecting an option from the context menu.

![Figure 3-6. Plot Context Menu](image)

<table>
<thead>
<tr>
<th>Selection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zoom to...</td>
<td>Selects a region of the plot.</td>
</tr>
<tr>
<td>Autoscale</td>
<td>Sets the Y-axis range to fit the data range in the plot window</td>
</tr>
<tr>
<td>Reset</td>
<td>Resets the Zoom window to its default setting</td>
</tr>
<tr>
<td>Help</td>
<td>Displays shortcut keys and mouse mappings for scaling and zooming</td>
</tr>
</tbody>
</table>

3.11 Saving and Loading

3.11.1 Configurations

Configurations can be saved and loaded. To save a configuration, click on the "Save" icon. To load a configuration, click on the "Open" icon.

Configurations include all register names, current values, and default values. They are saved in Comma Separated Files (*.csv) and can be modified using a text or spreadsheet editor.

3.11.2 Plot Data

Right-click a plot and select “Save Data…”

Data can be saved to a new file or an existing one. If an existing file is chosen, data will be appended.
3.11.3 Data Log

It is also possible to save all the data collected by the GUI in a log file. First of all click on the "Save To…" button to create and name a data log file. Next click the "Log Data" button. The data will be saved in the Comma Separated Value format.

Figure 3-7. Saving Data from a Plot

Figure 3-8. Data Log
The GUI controls the configurations of all the FDC1004 registers.

While the FDC1004 can be configured with 1 to 4 measurement setups, the GUI expects all 4 of the measurement setups to be configured. For an application which needs less than four measurement setups (e.g. a fluid level sensing which only needs 3 measurement setups), it is still necessary to configure any unused measurement setups. A good approach for any unconfigured measurement setups is to duplicate the first measurement setup (e.g. for a fluid level sensing application which has 3 measurement setups; the fourth measurement still needs to be configured, so set the fourth measurement setup with the same configuration as the first setup). Refer to the Datasheet for further details on how to configure the FDC1004 channels.

The FDC1004EVM has been designed to support a sub set of the FDC1004 configuration. The following list shows the supported configurations:

(a) Cin_n, n=1..4 vs. GND, CAPDAC disabled;
(b) Cin_n, n=1,2 vs. GND, CAPDAC enabled;
(c) Cin1 vs. Cin_m, m=3,4 (COFF in the EVM schematic is populated and sensor module is connected or when the sensor module is removed and a sensor is connected to Cin3);
(d) Cin2 vs. Cin_m, m=3,4 (only when the sensor module is removed and a sensor is connected to Cin2);
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