ANALOG DEVICES

EV-TEMPSENSE-ARDZ User Guide
UG-1656

One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

Using the EVAL-ADT7420ARDZ Shield with Arduino or Linduino Hardware

FEATURES

Fully featured Arduino shield for the ADT7410, ADT7420, ADT7310, and ADT7320
PC control in conjunction with the Arduino IDE

EVALUATION KIT CONTENTS

EV-TEMPSENSE-ARDZ kit
- EVAL-ADT7420ARDZ evaluation board (shield)
- EVAL-ADT7420MBZ remote evaluation board
- EVAL-ADT7320MBZ remote evaluation board

2 plastic screws and washers
6-way and 4-way ribbon cables

EQUIPMENT NEEDED

Arduino or Linduino development board
USB cable (A type end to B type end)
PC or laptop running Windows® 10 operating system

SOFTWARE NEEDED

LTSketchbook
ADT7420 No-OS driver
Arduino IDE

ONLINE RESOURCES

Evaluation board schematics and bill of materials

GENERAL DESCRIPTION

The ADT7410, ADT7420, ADT7310, and ADT7320 are high accuracy digital temperature sensors offering breakthrough performance over a wide industrial temperature range. The devices contain an internal band gap reference, a temperature sensor, and a 16-bit analog-to-digital converter (ADC) to monitor and digitize the temperature to 0.0078°C resolution. The devices are available in I²C or SPI versions.

The EV-TEMPSENSE-ARDZ is an evaluation board kit that allows easy evaluation of the ADT7410, ADT7420, ADT7310, and ADT7320 precision digital temperature sensors. Users can interface to these sensors on the Arduino evaluation board (shield), or with the ribbon cable connected to the external sensors. Consult the ADT7410, ADT7420, ADT7310, and ADT7320 data sheets in conjunction with this user guide when using the EV-TEMPSENSE-ARDZ with the Arduino integrated development environment (IDE).

EV-TEMPSENSE-ARDZ FUNCTIONAL BLOCK DIAGRAM

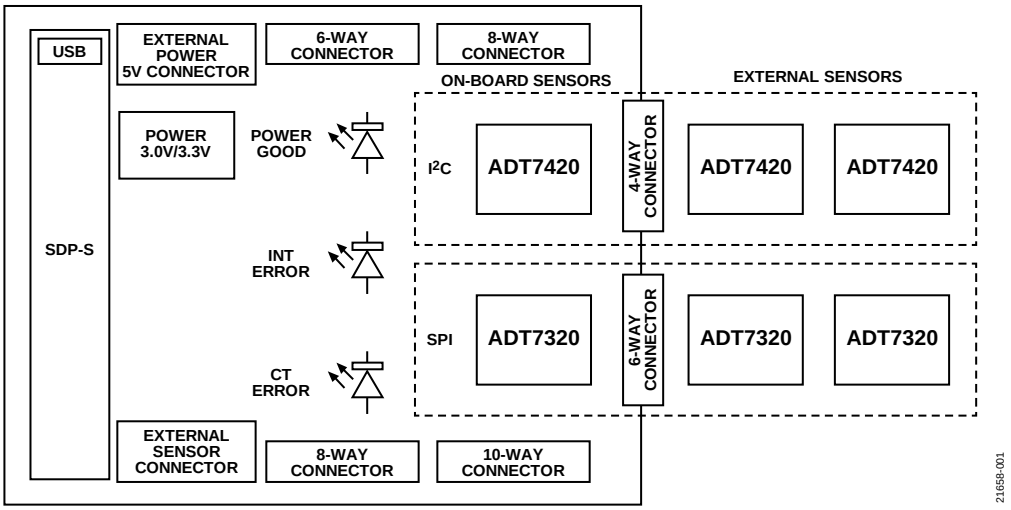

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

10/2019—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

HARDWARE SETUP

The EV-TEMPSENSE-ARDZ development kit contains the following boards (see Figure 2 to Figure 4):

- The EVAL-ADT7420ARDZ shield
- The EVAL-ADT7420MBZ remote evaluation board
- The EVAL-ADT7320MBZ remote evaluation board

Place the EVAL-ADT7420ARDZ shield on top of the Arduino™ development board by matching up the EVAL-ADT7420ARDZ shield power with the P4, P5, P6, and P7 analog and digital connectors (see Figure 5).

Connect the 4-way ribbon cable and the external EVAL-ADT7420MBZ printed circuit board (PCB) to Connector P1 on the EVAL-ADT7420ARDZ shield.

Connect the 6-way ribbon cable and the external EVAL-ADT7320MBZ PCB to Connector P2 on the EVAL-ADT7420ARDZ shield.

See Figure 5 for a connection diagram of all of the boards.

LOCATION OF EVALUATION BOARD SCHEMATICS

The evaluation board schematic diagrams and bill of materials are included with all the supporting documentation on the EV-TEMPSENSE-ARDZ product page.

POWER SUPPLIES

The EVAL-ADT7420ARDZ shield is powered by the 5 V power supply from the Arduino development board and this power supply is regulated to either 3.0 V or 3.3 V, selected by the EVAL-ADT7420ARDZ, JP1. The default setting of the power supply is 3.0 V. Alternatively, the EVAL-ADT7420ARDZ shield can be powered externally via P10, which is selected by changing the JP2 jumper Position B.

The EVAL-ADT7420MBZ and the EVAL-ADT7430MBZ evaluation boards are powered with the same 5 V power supply, but are selected by P1 and P2, respectively.

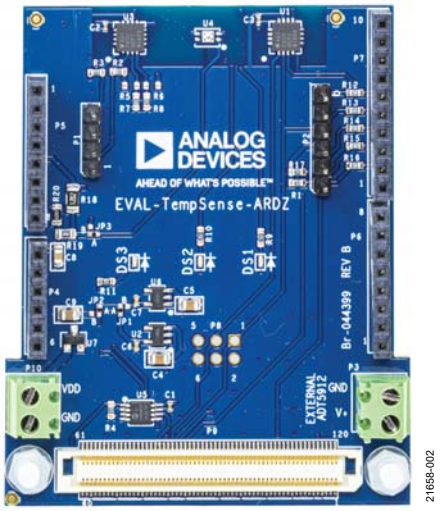

Figure 2. EVAL-ADT7420ARDZ Evaluation Board

Figure 3. EVAL-ADT7420MBZ Evaluation Board

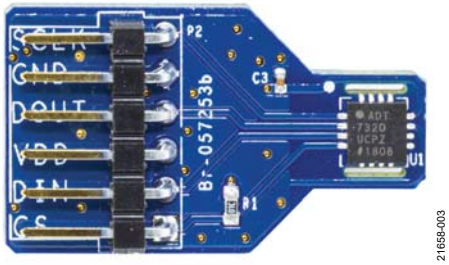

Figure 4. EVAL-ADT7320MBZ Evaluation Board

Figure 5. Hardware Connected Diagram

INSTALLING THE ARDUINO IDE

Download the latest version of the Arduino software from the **Arduino IDE** link located under the **Setup** section from the www.analog.com/en/design-center/evaluation-hardware-and-software/linduino site. For more information on how to install the Arduino IDE, visit the Arduino home page.

INSTALLING THE LTSKETCHBOOK

To install and set up the LTSketchbook, take the following steps:

1. If using the Linduino hardware for the first time, visit the Linduino page at www.analog.com/en/design-center/evaluation-hardware-and-software/linduino.html for instructions on how to install the LTSketchbook.
2. Download the latest Linduino sketchbook, **LTSketchbook.zip**, from www.analog.com/media/en/engineering-tools/design-tools/LTSketchbook.zip. This zip file contains the entire code base for the Linduino board, which includes all demo code, libraries for individual devices, and auxiliary functions.
3. Extract this zip file (right click the file) to a location for working files, such as the **Documents** folder.
4. To change the Arduino IDE settings to use the LTSketchbook, open the Arduino IDE software and navigate to **File** > **Preferences**, which opens the window shown in Figure 6.

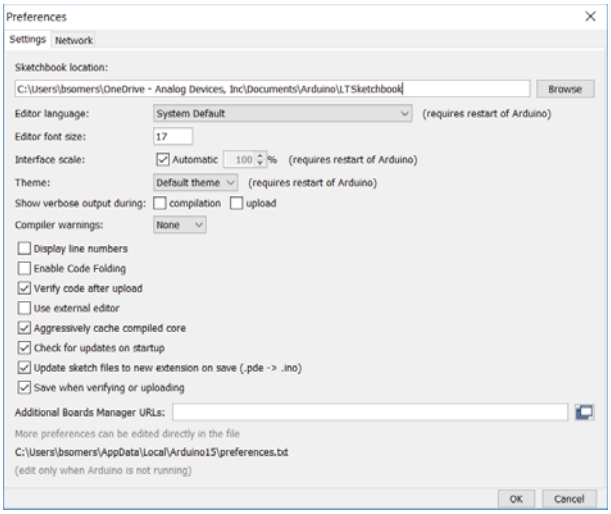

Figure 6. Arduino IDE Preferences Window

5. In the **Sketchbook location** field shown in Figure 6, click **Browse** and locate the path to the extracted **LTSketchbook.zip** file. The correct file location is shown in the **LTSketchbook** option in the **Look in** dropdown menu and the following seven subdirectories are shown: **Active Learning**, **Documentation**, **Example Designs**, **libraries**, **Part Number**, **User Contributed**, and **Utilities** (see Figure 7).

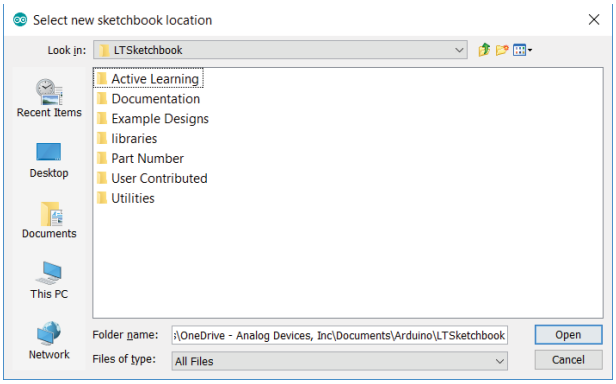

*Figure 7. **LTSketchbook** Location*

6. Note that changing the LTSketchbook location affects how the built in compiler reads the libraries saved on the default **Arduino/libraries** folder. This folder is automatically created after installing the Arduino.

ADT7420 NO OPERATING SYSTEM (NO-OS) DRIVER

Download the **adt720.h** and **adt7420.c** files, required to operate the No-OS driver, from the Analog Devices, Inc., GitHub repository, as shown in Figure 8. Go to www.github.com/analogdevicesinc/no-OS to download the files.

The No-OS driver path is **no-OS/drivers/temperature/adt7420/** (see Figure 8).

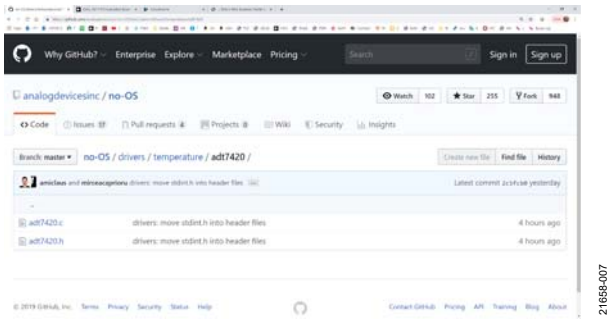

Figure 8. Analog GitHub Repository

In the **LTSketchbook/libraries** folder automatically created after Step 3 in the Installing the LTSketchbook section (see Figure 7), create a new folder and name it **adt7420**. Copy and paste the **adt7420.h** and **adt7420.c** files into the newly created **adt7420** folder, as shown in Figure 9.

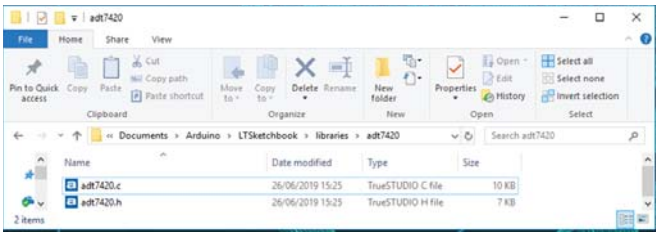

*Figure 9. **Documents/Arduino/LTSketchbook/libraries/adt7420** Folder*

LOAD EXAMPLE SKETCH

After downloading and placing all files in the correct location, take the following steps to load an example sketch from the LTSketchbook:

1. Close and open a new Arduino IDE. In the Arduino IDE, navigate to **File** > **Sketchbook** > **LTSketchbook** > **Part Number** > **ADI-Parts** > **EVAL-ADT7420** (see Figure 10). A new window opens with the EVAL-ADT7420ARDZ example software. This software allows the user to use the EVAL-ADT7420ARDZ shield with the Arduino board.

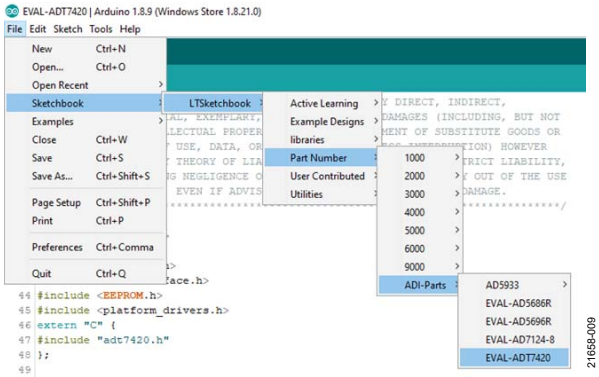

Figure 10. Arduino IDE Load Sketch Example

2. Plug the Arduino board to the PC via the USB cable. Select the board type and serial port by navigating to **Tools** > **Port** and select the serial device of the board as shown in Figure 11.

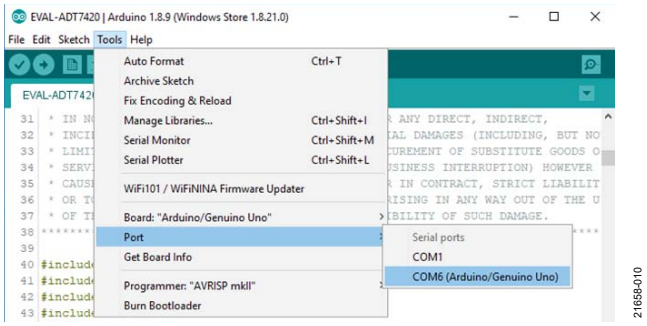

Figure 11. Arduino IDE Communications Port

3. Upload the sketch from Step 1 to the Arduino board by clicking the right pointing arrow button shown in Figure 12.

Figure 12. Arduino IDE Upload Sketch

4. When the uploading process is completed, a message at the bottom of the IDE displays the message in Figure 13.

Figure 13. Arduino IDE Upload Success

5. Open the serial monitor by navigating to **Tools** > **Serial Monitor** (see Figure 11 for the **Tools** dropdown list). Select **Newline** for the dropdown list circled in red in Figure 14 and set the baud rate to 115200. To use the serial monitor, enter the commands in Figure 14 in the text box at the top of the window and click **Send**.

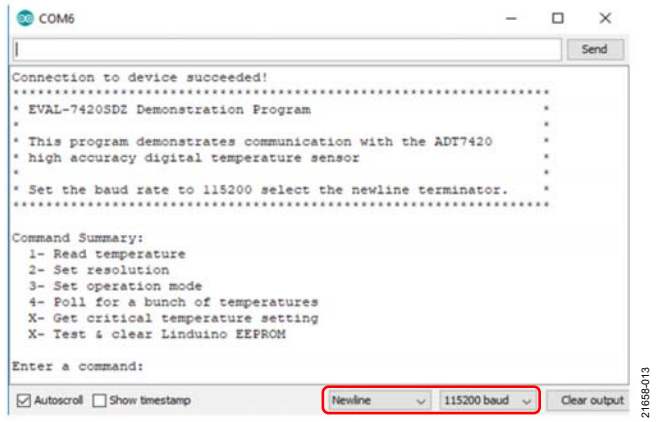

Figure 14. Arduino IDE Serial Monitor

USING AN EXTERNAL ADT7420

To select the remote ADT7420, close the serial monitor and change the device address to 0x49 in the sketch example (see Figure 15). Verify and upload the sketch to the Arduino board, then wait until the code finishes uploading and the message in Figure 13 is shown. Next, open the serial monitor.

Figure 15. Arduino IDE Code Change

Note that the ADT7310, ADT7320, and ADT7410 can also be selected, but this example sketch only considers the ADT7420 and users must modify the code shown in Figure 15 accordingly.

NOTES

I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

UG21658-0-10/19(0)