

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).

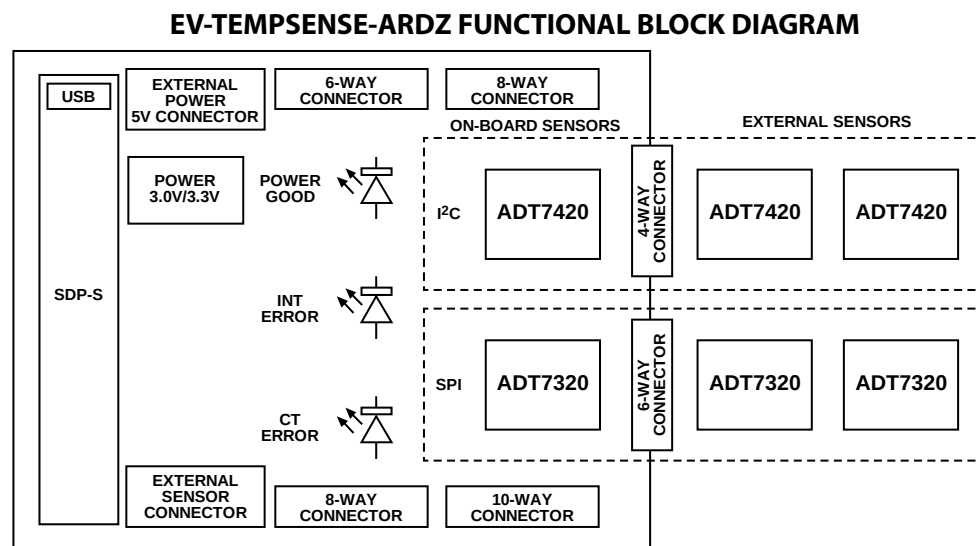


Figure 1.

21656-001

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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.

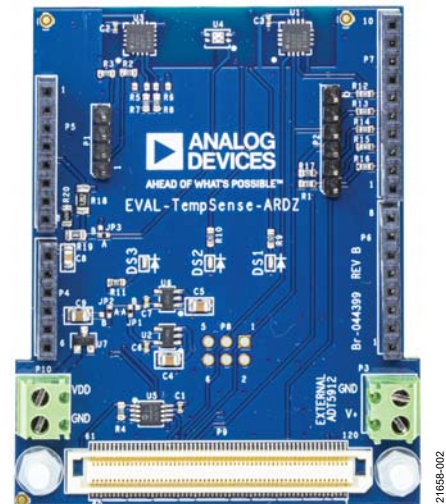


Figure 2. [EVAL-ADT7420ARDZ](#) Evaluation Board

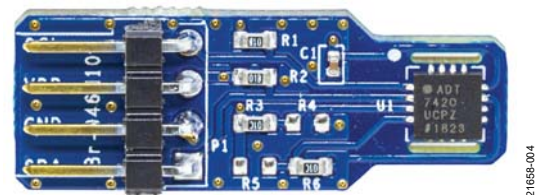


Figure 3. [EVAL-ADT7420MBZ](#) Evaluation Board

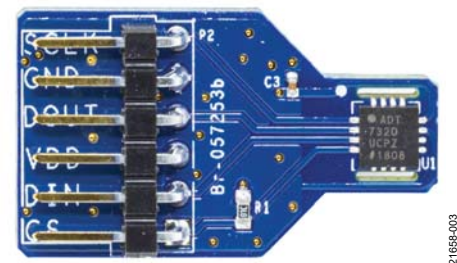


Figure 4. [EVAL-ADT7320MBZ](#) Evaluation Board



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.

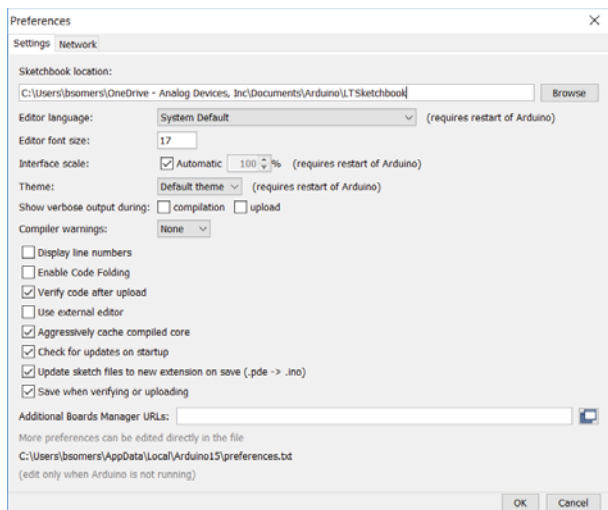


Figure 6. Arduino IDE Preferences Window

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).

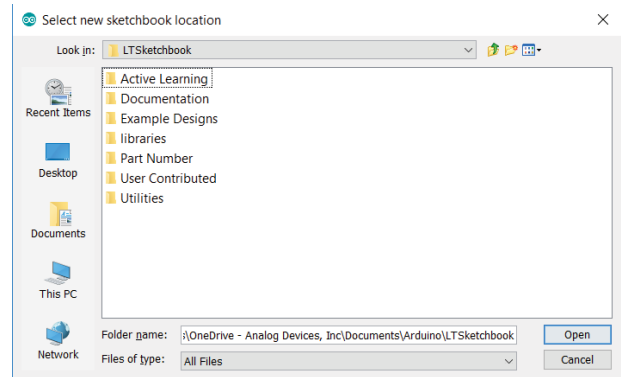


Figure 7. LTSketchbook Location

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).

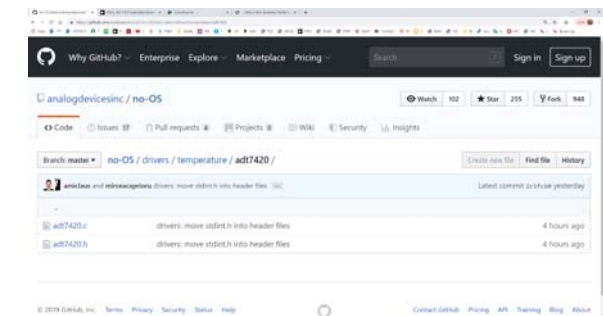


Figure 8. Analog GitHub Repository

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.

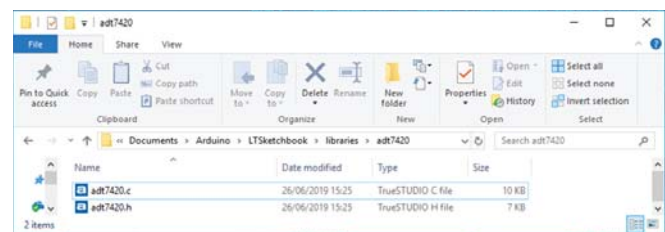


Figure 9. Documents/Arduino/LTSketchbook/libraries/adt7420 Folder

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.

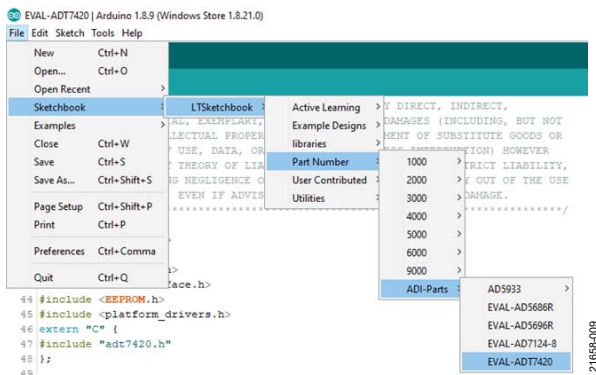


Figure 10. Arduino IDE Load Sketch Example

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.

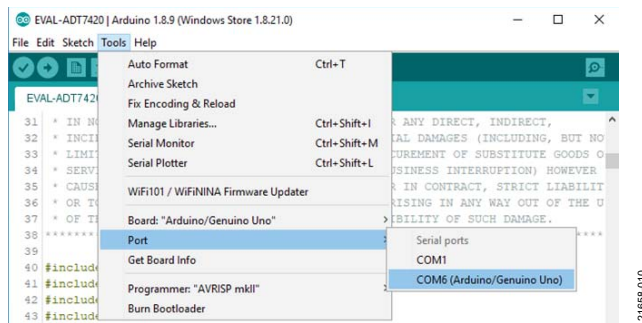


Figure 11. Arduino IDE Communications Port

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

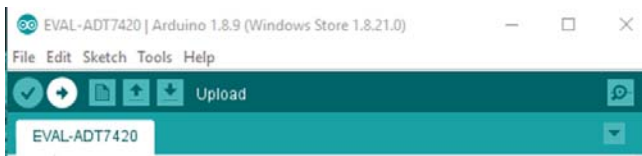


Figure 12. Arduino IDE Upload Sketch

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

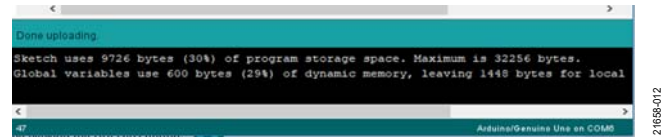


Figure 13. Arduino IDE Upload Success

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**.

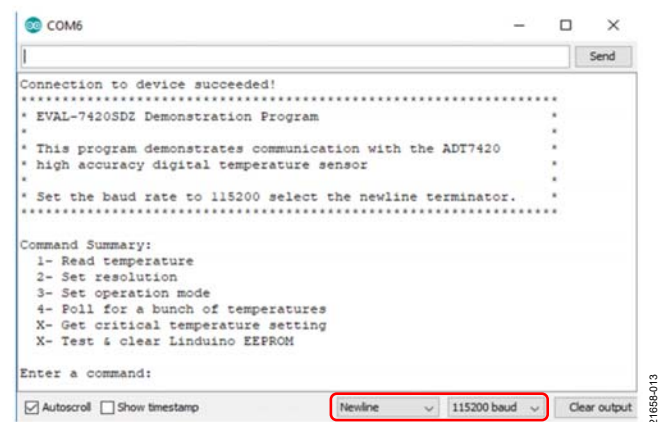


Figure 14. Arduino IDE Serial Monitor

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.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.