

EVAL-ADUCM331QSPZ Development System Getting Started Tutorial

DEVELOPMENT SYSTEM KIT CONTENTS

Evaluation board ([EVAL-ADUCM331QSPZ](#)) that facilitates evaluation of the device with minimum external components

Analog Devices, Inc., J-Link OB emulator (USB-SWD/UART-EMUZ)

USB cable

INTRODUCTION

The [ADuCM330/ADuCM331](#) are fully integrated, 8 kSPS, data acquisition systems incorporating dual, high performance, Σ - Δ analog-to-digital converters (ADCs), with a 32-bit ARM Cortex™-M3 processor and Flash/EE memory on a single chip.

The [ADuCM330/ADuCM331](#) are complete system solutions for battery monitoring in 12 V automotive applications. The [ADuCM330/ADuCM331](#) integrate all of the required features to precisely and intelligently monitor, process, and diagnose 12 V battery parameters including battery current, voltage, and temperature over a wide range of operating conditions. The [ADuCM330](#) has 96 kB program flash, and the [ADuCM331](#) has 128 kB program flash.

GENERAL DESCRIPTION

The [EVAL-ADUCM331QSPZ](#) development system supports both the [ADuCM330](#) and the [ADuCM331](#) and allows a flexible platform for evaluation of the [ADuCM330/ADuCM331](#) silicon. It allows quick removal and insertion of a device via a 32-lead LFCSP socket. It also provides the connections necessary to allow rapid measurement setups. Switches and LEDs are provided on the applications board to assist in debugging and simple code development. Sample code projects are also provided to show key features of each peripheral and examples of how they can be configured.

This user guide provides step-by-step details of how to set up and configure the example software available on the [ADuCM33x Design Tools](#) page.

By working through this user guide, users can start to generate and download their own user code for use in their own, unique end-system requirements.

Full specifications on the [ADuCM330/ADuCM331](#) are available in the product data sheet, which should be consulted in conjunction with this user guide when working with the evaluation board.

EVAL-ADUCM331QSPZ SOCKETED EVALUATION BOARD SETUP

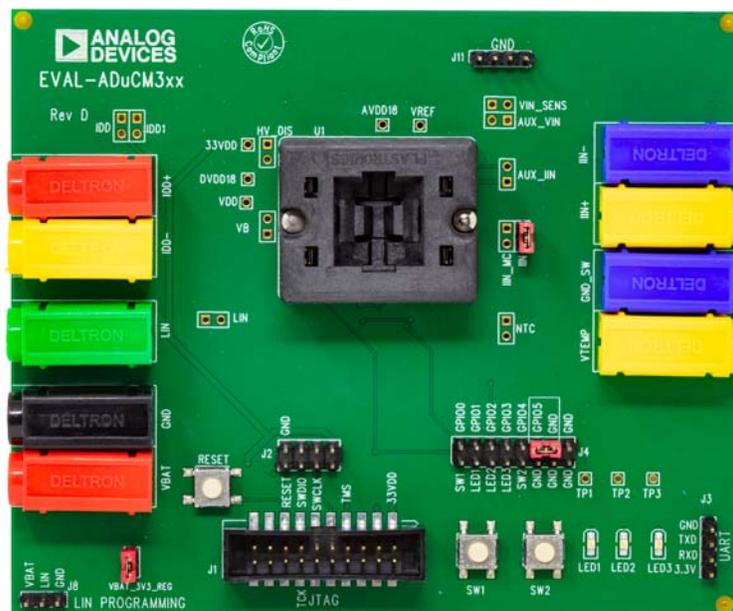


Figure 1.

TABLE OF CONTENTS

Development System Kit Contents	1	Verifying the J-Link Driver	3
Introduction	1	Connect the Development System	4
General Description	1	Jumper Functionality	4
EVAL-ADUCM331QSPZ Socketed Evaluation Board Setup.....	1	Keil μ Vision5 Integrated Development Environment.....	5
Revision History	2	Introduction	5
Getting Started	3	Quick Start Steps	5
Software Installation Procedure	3		
Installing	3		

REVISION HISTORY

1/2019—Rev. 0 to Rev. A

Change to Figure 1	1
Changes to Figure 3, Figure 4, and Table 1	4

7/2015—Revision 0: Initial Version

GETTING STARTED

SOFTWARE INSTALLATION PROCEDURE

Items required to get started are as follows:

- Keil μ Vision v5 or higher
- CMSIS pack for [ADuCM330/ADuCM331](#)
- Segger debugger interface driver and utilities

Complete the steps described in this section before plugging any of the USB devices into the PC.

Support files for Keil are provided at the [ADuCM33x Design Tools](#) page. For Keil v5 upwards, CMSIS packs are required and are available on the [ADuCM330/ADuCM331](#) product pages.

INSTALLING

To install the software, take the following steps:

1. Close all open applications.
2. Download and install Keil μ Vision v5 (or higher) from the Keil website.
3. From the Segger website, download and install the latest **J-Link software & documentation pack for Windows**.
4. From the [ADuCM330/ADuCM331](#) product page, download the CMSIS pack for the [ADuCM330/ADuCM331](#).

VERIFYING THE J-LINK DRIVER

Installing the J-Link driver is a three-step process.

1. Follow the sequence of instructions provided by Segger to download and install the J-Link driver.
2. When the software installation is complete, plug the debugger/programmer into the USB port of your PC using the USB cable supplied.
3. Verify that the emulator board appears in the Windows® **Device Manager** window (see Figure 2).

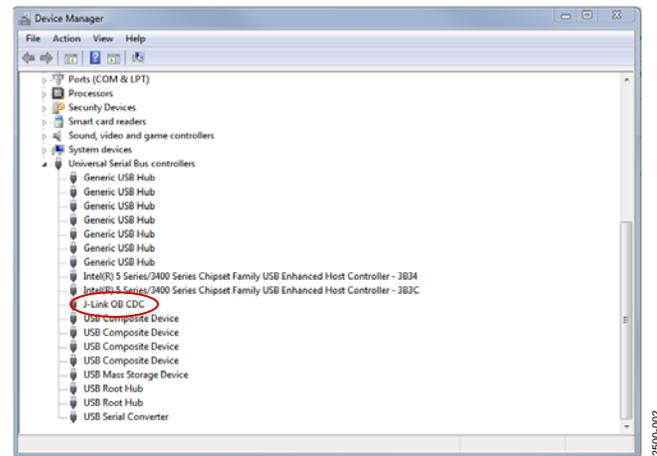


Figure 2. Device Manager

CONNECT THE DEVELOPMENT SYSTEM

To connect the development system, take the following steps:

1. Ensuring correct orientation, insert an [ADuCM330/ADuCM331](#) device. Note that Pin 1 of the device is indicated by a dot in the corner. The dot on the device must be orientated with the dot on the socket, as shown in Figure 3.



Figure 3. ADuCM331 Device Orientation

2. Connect the debugger/programmer, noting the correct orientation as shown in Figure 4.
3. Connect a 12 V supply between VBAT and GND.

4. Ensure that the board jumpers are in position, as shown in Figure 1.
5. Ensure that the GPIO5 jumper is in place. The GPIO5 jumper is used by the on-board kernel to determine program flow after a reset. See the Kernel section in the [ADuCM331WFS Hardware Reference Manual \(UG-1423\)](#) for full details.
6. Press **RESET**.

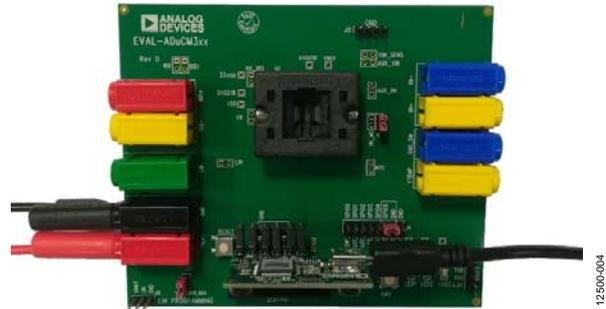


Figure 4. Mini-Link Debugger/Programmer Connection

JUMPER FUNCTIONALITY

Table 1.

Jumper	Functionality
J4, GPIO0	These jumpers connect the SW1 push button to the GPIO0 pin of the device.
J4, GPIO1, GPIO2, GPIO3	These jumpers connect the LEDs to the GPIO1, GPIO2, and GPIO3 pins of the device.
J4, GPIO4	These jumpers connect the SW2 push button to the GPIO4 pin of the device.
J4, GPIO5	This jumper ties the GPIO5 pin of the device to GND. This jumper must be connected when programming the device or when accessing via serial wire debug (SWD).
VBAT_3V3_REG	This jumper enables the 3.3 V regulator on the underside of the printed circuit board (PCB). This jumper powers the LEDs or an additional 3.3 V source.
LIN	This jumper is not inserted and connected via the 0 Ω link. This jumper can disconnect the LIN terminal (green banana socket) from the device when the 0 Ω link is removed.
IDD, IDD1	These jumpers are not inserted and connected via the 0 Ω link. This jumper allows the insertion of an ammeter in series with the VBAT supply through the I _{DD+} /I _{DD} sockets for current measurement when the 0 Ω link is removed.
VB	This jumper is not inserted and is connected via the 0 Ω link. This jumper disconnects the VBAT supply from the device VBAT input when the 0 Ω link is removed.
AUX_VIN	This jumper is not inserted. The VIN _x _AUX device pins are connected to GND via the 0 Ω link.
VIN_SENS	This jumper is not inserted. This jumper connects a sensor to the VIN _x _AUX input of the device when the 0 Ω link connecting the VIN _x _AUX to GND is removed.
IIN	This jumper shorts the inputs of the current channel ADC.
IIN_MC	This jumper is not inserted. This jumper connects to the signal at the IIN+ and IIN– pins of the device.
AUX_IIN	This jumper is not inserted. The IIN _x _AUX device pins are connected to GND via the 0 Ω link.
NTC	This jumper is not inserted. This jumper allows an external temperature device to be connected between VTEMP and GND_SW of the device.
J1	J1 is the JTAG programming interface. This interface allows the use of a JTAG with SWD capability.
J2	J2 is the SWD programming interface. See the orientation shown in Figure 4.
J3	J3 allows GPIO1 and GPIO4 to be used as UART connections, operating the device LIN logic in UART mode.
J4	J4 is a GPIO header.
J8	J8 is a header for programming the flash via LIN using the USB-I2C/LIN-CONVZ dongle.
J11	Ground header.

KEIL μ VISION5 INTEGRATED DEVELOPMENT ENVIRONMENT

INTRODUCTION

The Keil μ Vision5 integrated development environment (IDE) integrates all the tools necessary to edit, assemble, and debug code. The ADuCM330/ADuCM331 development system supports nonintrusive emulation limited to 32 kB code. This section describes the project setup steps to download and debug code on an ADuCM330/ADuCM331 development system. It is recommended to use the J-Link debugger driver.

QUICK START STEPS

Starting μ Vision5

First, ensure that the CMSIS pack for the ADuCM330/ADuCM331 has been installed (see the Getting Started section).

After installing Keil μ Vision5, a shortcut appears on the PC desktop. Double-click the shortcut to open Keil μ Vision5.

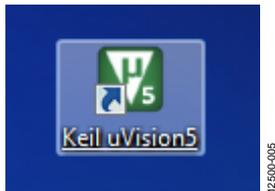


Figure 5. Keil μ Vision5 Desktop Shortcut

1. When Keil opens, click the **Pack Installer** button on the toolbar.



Figure 6. Pack Installer Button

2. The **Pack Installer** window opens.

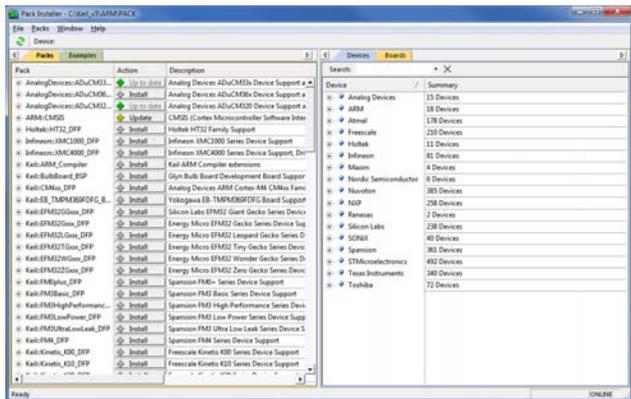


Figure 7. Pack Installer Window

3. Install the CMSIS pack. In the **Pack Installer** window, click **File > Import** and locate the downloaded CMSIS pack. Follow the on-screen prompts to install.
4. In the right-hand side of the window, under the **Devices** tab, click **Analog Devices > ADuCM33x Series > ADuCM330**.

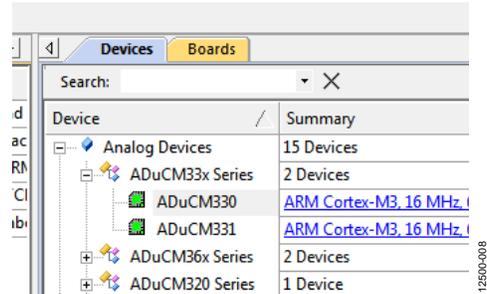


Figure 8. Devices Tab

5. In the left-hand side of the window, click the **Examples** tab.

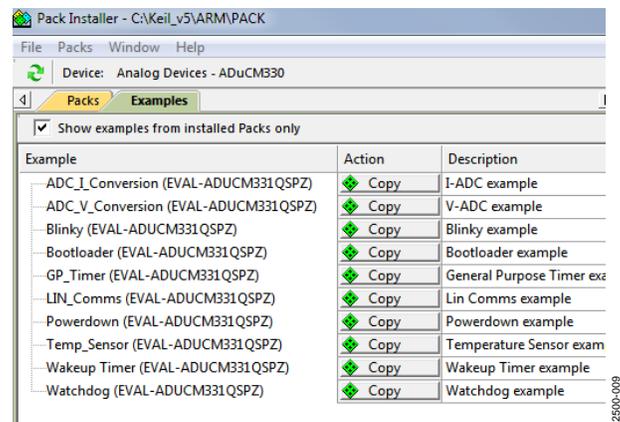


Figure 9. Examples Tab

6. Select the **Blinky** example and click **Copy**.
7. Choose a destination folder and click **ok**. This installs the **Blinky** example and necessary startup files to your PC.

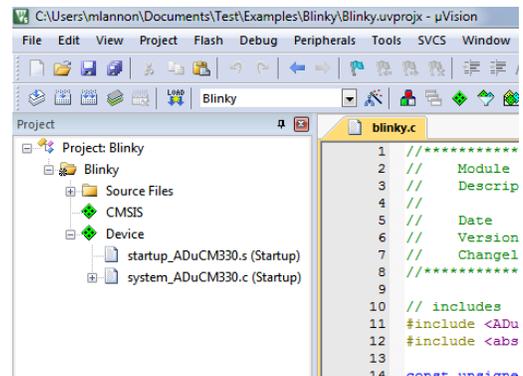


Figure 10. Blinky Example

8. The example must be compiled by clicking the **Rebuild** button on the toolbar.



Figure 11. Rebuild Button

9. When the build is complete, the message shown in Figure 12 appears.

```
Build Output
Rebuild target 'Blinky'
compiling blinky.c...
assembling startup_ADuCM330.s...
compiling system_ADuCM330.c...
linking...
Program Size: Code=564 RO-data=1484 RW-data=0 ZI-data=352
".\Objects\Blinky.axf" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:05
```

Figure 12. Build Output

10. To download the code to the [EVAL-ADUCM331QSPZ](#) board, click **Load**.

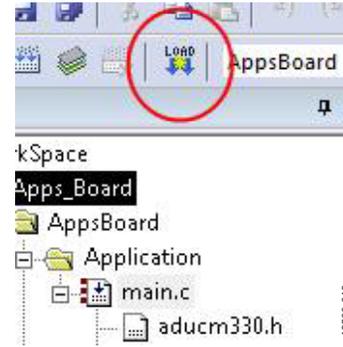


Figure 13. Load Button

11. When the code is downloaded to the applications board, the two LEDs blink repeatedly.



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.