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

Evaluating the ADAU7118 8-Channel PDM to I²S/TDM Converter

EVALUATION KIT CONTENTS

EVAL-ADAU7118Z evaluation board
USBi control interface board (EVAL-ADUSB2EBZ)
USB cable

ADDITIONAL DOCUMENTATION NEEDED

ADAU7118 data sheet

ADDITIONAL OPTIONAL HARDWARE

PC running Windows XP or later

ADDITIONAL OPTIONAL SOFTWARE

SigmaStudio software or the Automated Register Window Builder software (available for download from the Analog Devices, Inc., website)

GENERAL DESCRIPTION

This user guide describes the design and setup of the evaluation board for the ADAU7118. The ADAU7118 is a converter that takes in a Pulse Density Modulation signal from a MEMS (Micro Electromechanical System) microphone and converts it into an I²S (Inter IC Serial bus) signal or a time domain multiplexed (TDM) serial communication bus. The EVAL-ADAU7118Z can be set to operate in hardware mode or configured to control the ADAU7118 via I²C communication interface. An I²S serial interface is accessible via header pins spaced at 0.1 inches. Pulse density modulation (PDM) data and the clock interface are available on these headers. The evaluation board can be connected to an external 5 V dc power supply and ground or can be powered from the USB interface. On-board regulators derive supplies of 3.3 V, 1.8 V, and 1.2 V. The evaluation board can be configured to operate fully from external power supplies bypassing the on-board regulators. Current measurements of the ADAU7118 are made with the supplied header pins.

The ADAU7118 can be controlled through an I²C interface. A small, external interface board, EVAL-ADUSB2EBZ, (USBi) connects to a PC USB port and provides I²C access to the evaluation board through a ribbon cable. The USBi is not required to control the evaluation board from a user supplied I²C master controller.

The Automated Register Window Builder graphical user interface (GUI) simplifies programming the device in a Windows® PC environment. The SigmaStudio GUI can also be used to control the ADAU7118. The evaluation board allows demonstration and performance testing of the features of the ADAU7118.

EVALUATION BOARD PHOTOGRAPH

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

5/2019—Revision 0: Initial Version

EVALUATION BOARD OVERVIEW

Figure 2 shows an overview of the EVAL-ADAU7118 setup.
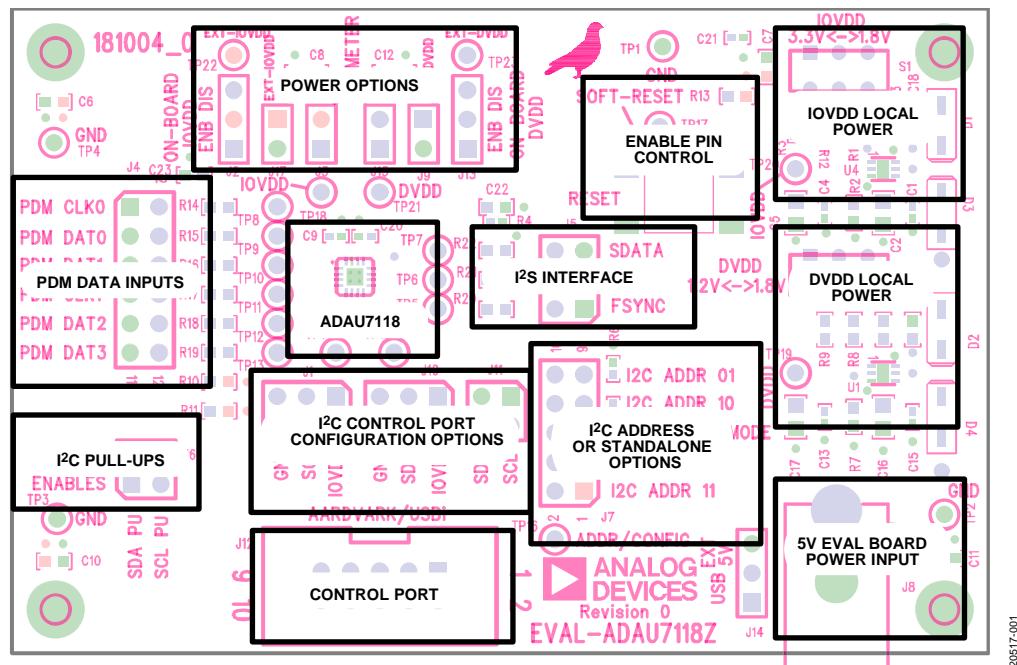
*Figure 2. EVAL-ADAU7118Z*

EVALUATION BOARD HARDWARE

HARDWARE SETUP—USBi

To set up the USBi hardware, take the following steps:

1. Plug the USBi ribbon cable into the I²C/SPI port (J12).
2. Connect the USB cable to the PC and the USBi.
3. When prompted for drivers take the following steps:
   a. Select **Install from a list or a specific location**.
   b. Select **Search for the best driver in these locations**.
   c. Check the box for **Include this location in the search**.
   d. Navigate to the USBi driver, **C:\Program Files\ Analog Devices Inc\AutomatedRegWin\USB drivers**.
   e. Click **Next**.
   f. If prompted to choose a driver, select **CyUSB.sys**.
   g. If the PC is running Windows XP and a message appears stating that the software has not passed Windows logo testing, click **Continue Anyway**.
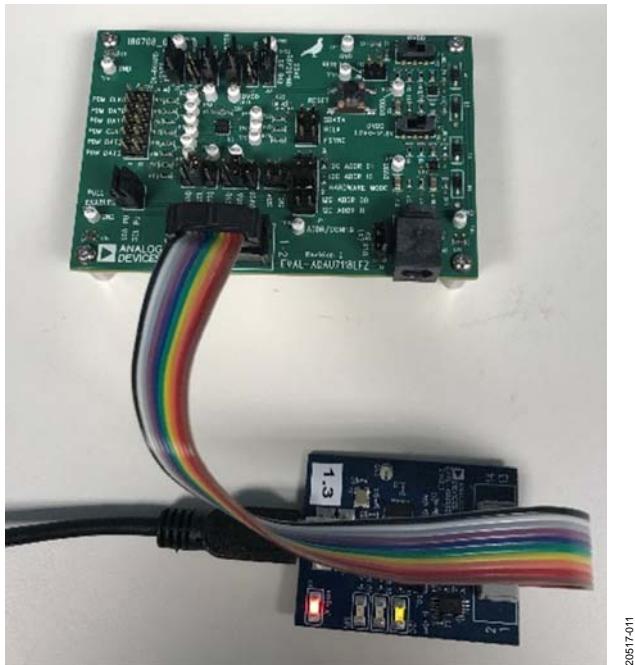
Figure 3. Connecting the USBi

The user can now open the Automated Register Window Builder application and load the **.xml** file.

POWERING THE BOARD

The EVAL-ADAU7118 evaluation board requires a power supply input of 5 V dc to 10 V dc and ground to the power jack. Plug the 10-way ribbon cable on the USBi into the I²C port (J12) on the evaluation board.

The on-board regulators provide the IOVDD and DVDD voltage rails. The IOVDD is switchable between 3.3 V and 1.8 V. The DVDD supply is switchable between 1.8 V and 1.2 V.

The J2 and J13 jumpers allow the user to disable the internal regulators to allow the injection of external power.
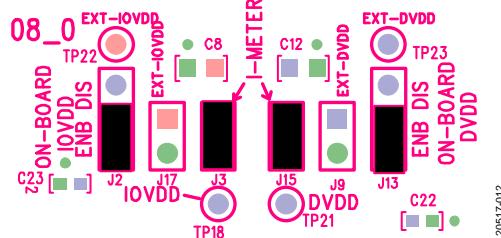

Figure 4. AVDD and IOVDD Jumper Positions for On-Board Power

The J3 and J15 jumpers are included for access to the IOVDD and DVDD current path for measuring current to the ADAU7118. These jumpers are in series with the power source and the ADAU7118 when the internal on-board voltage regulators are used and when an external power supply is used.

Figure 5 shows the jumper settings to disable the on-board voltage regulators, which allows the user to connect an external power supply using the J17 and J9 jumpers. Pin 1 of each connector is the positive side of the power supply. Pin 2 of each connector is ground.
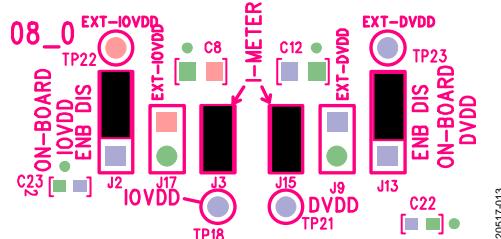

Figure 5. External Power Jumper Settings

The 5 V dc to 10 V dc input can come from two sources: via the USBi interface or via an external source. This 5 V dc to 10 V dc power supplies the internal regulators to operate the evaluation board using the on-board power. This supply is not required when powering the board from external IOVDD and DVDD supplies.
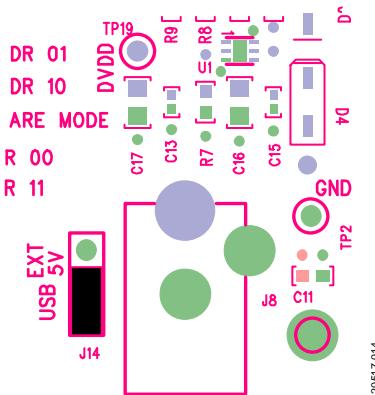

Figure 6. USB Power Jumper Setting
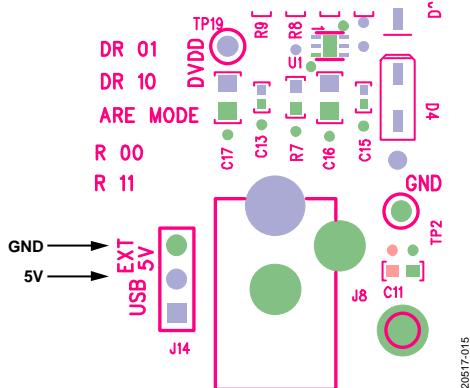
Figure 7. External Power Connections

Figure 7 shows the configuration for using an external 5 V dc supply using the J14 jumper. Figure 7 shows the J14 jumper removed, but it is not required to remove this jumper. The design has diodes to prevent currents flowing from one power supply to the other.

RESETTING THE EVALUATION BOARD

The EVAL-ADAU7118Z has provisions for disabling the ADAU7118. The S3 switch is connected to the enable pin (EN pin) of the ADAU7118. Pushing the S3 switch (RESET) disables the ADAU7118, which begins operation when released. The RESET switch places the ADAU7118 in a low power state and does not reset the register settings. To fully reset the evaluation board, remove and reapply power from the device. Figure 8 shows the RESET switch.
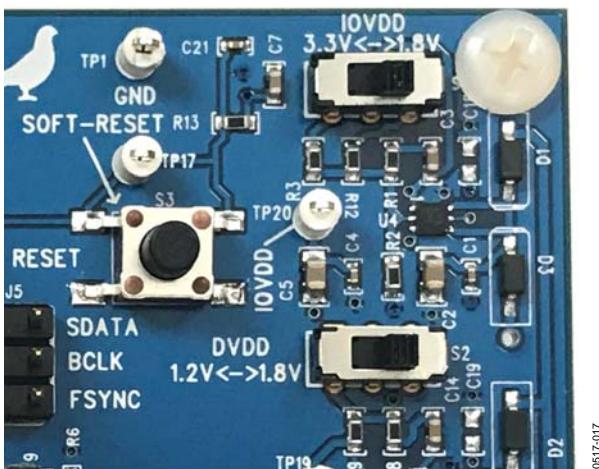
Figure 8. Reset Switch

CONNECTING THE PDM SIGNALS

Figure 9 shows the connections for the PDM signal sources and the PDM clock outputs on the J4 header. All odd pins are ground and the even pins are signals. The TP8 to TP13 test points allows the user to view the signal on an oscilloscope.

The 0 Ω resistors (R14 to R19) allow the addition of damping resistors.
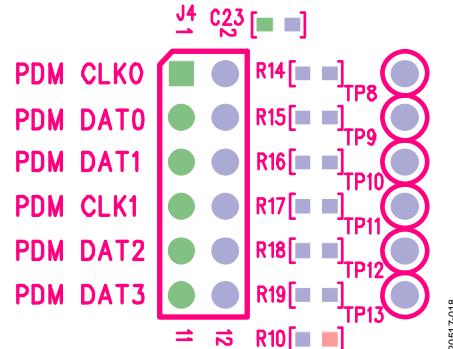
Figure 9. Connecting to the PDM Inputs

CONNECTING THE I²S SIGNALS

Figure 10 shows the I²S interface connections on the J5 header. All of the odd pin numbers are ground and the signals are on the even pins. TP5 through TP7 are provided to view the signal on an oscilloscope.

The 0 Ω resistors (R20 to R22) allow the addition of damping resistors.
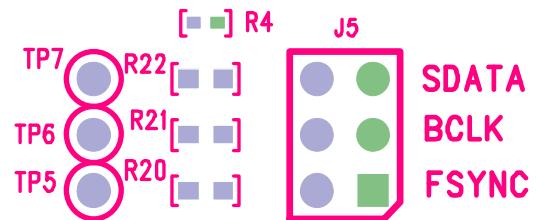
Figure 10. Connecting to the I²S Interface

HARDWARE MODE

The hardware mode of the ADAU7118 allows the user to choose between a limited number of operation modes without the need for a control interface. Applying a J7 jumper floats the ADDR/CONFIG pin (Pin 12) and enables hardware mode, as shown in Figure 11. The ADDR/CONFIG pin selections are listed in Table 1.

Table 1. ADDR/CONFIG Pin Options for J7 Jumper

I2C Address, Bit 2	I2C Address, Bit 1	ADDR/CONFIG Pin Configuration
1	1	Tie to IOVDD
0	0	Tie to GND
Hardware Mode 1	Hardware Mode 1	Open
1	0	Tie to IOVDD with 47 kΩ resistor
0	1	Tie to GND with 47 kΩ resistor

The two control port pins of the ADAU7118 are brought out to two blocks of jumpers (J1 and J10) on the EVAL-ADAU7118Z, which allows the user to assign each pin to either the I²C communication ports or select options in hardware mode. For hardware mode, the J1 and J10 jumpers can connect the individual pins to high (IOVDD) or low (GND) to put the ADAU7118 in the required mode.
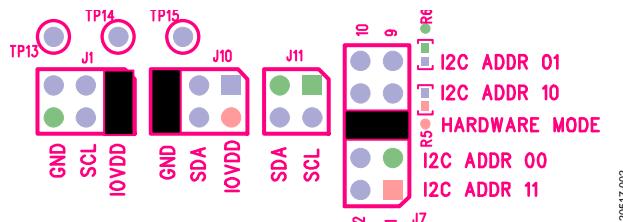
Figure 11. Hardware Mode, 8-Channel High Drive Setting

REAL-TIME CONTROL VIA THE I²C INTERFACE

The evaluation board can be configured for real-time control of the registers in the ADAU7118. The Automated Register Window Builder (ARWB) software can control the ADAU7118 when the software is installed and the USBi control interface is plugged into the board. For real-time control using the ARWB software, the ADAU7118 must be set to use Address 00 (ADDR 00)as the default setting of the ARWB software. Figure 12 shows the address settings when the device is configured for real-time control.
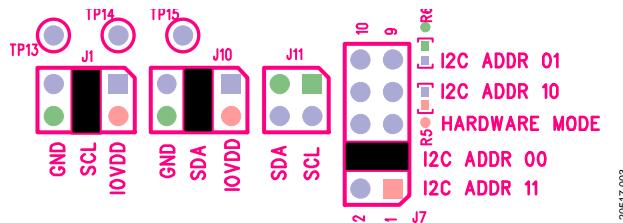
Figure 12. Real-Time Control, Default Address = ADDR 00

When using real-time control, there are two choices for connecting to the I²C bus.

- The SCL and SDA pins appear on the J12 control port connector, the Aardvark/USBi 10-pin header. An Aardvark interface or a USBi interface can be directly plugged into the J12 control port connector.
- The J11 jumper is a convenient connection point for an external I²C bus on another printed circuit board (PCB).

When using the J11 jumper to connect to the external I²C bus, note the following:

- Pin 2 is the connection to the SCL pin.
- Pin 4 is the connection to the SDA pin.
- The J1 and J10 jumpers must be set to the center SCL/SDA position.
- The odd pins (Pin 1 and Pin 3) are grounded to allow running ground along with the signal lines to maintain signal integrity.

The SDA and SCL signal lines have two weak 10 kΩ pull-up resistors. These weak resistors often do not pose a problem with loading down the I²C bus and are sufficient for slower speed use of the I²C interface. The J6 jumper can remove the resistors from the circuit if pull-up resistors exist elsewhere.
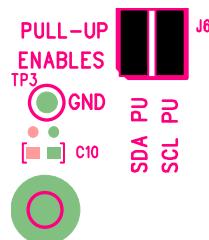
Figure 13. On-Board I²C Pull-Up Resistors

EVALUATION BOARD SOFTWARE

CONTROLLING THE ADAU7118 USING SigmaStudio SOFTWARE

The SigmaStudio software communicates with the EVAL-ADAU7118 evaluation board. SigmaStudio requires a PC running Windows XP or later with a USB interface and an internet connection. The PC communicates with the evaluation board using the included USBi interface. SigmaStudio is a fully GUI-based control environment. A full version of SigmaStudio, which includes the required USBi drivers, is available for download from the SigmaStudio software page.

INSTALLING THE SigmaStudio SOFTWARE

To download the latest version of SigmaStudio, take the following steps:

1. Go to the SigmaStudio software page on the Analog Devices website and select the latest version of the SigmaStudio software from the **Downloads and Related Software** section.
2. Determine whether the software must be installed on a 32-bit or 64-bit version of Windows, and locate the latest release version of SigmaStudio as appropriate.
3. Download the installer for and execute the executable. Follow the prompts, and accept the license agreement to install the software.

SETTING UP THE SigmaStudio PROJECT

1. Click the icon in the far upper left of the SigmaStudio application window to open a new project. Find the **ADAU7118** in the **Tree Toolbox** (see Figure 14) and drag and drop it in the **Hardware Configuration** tab (see Figure 16).
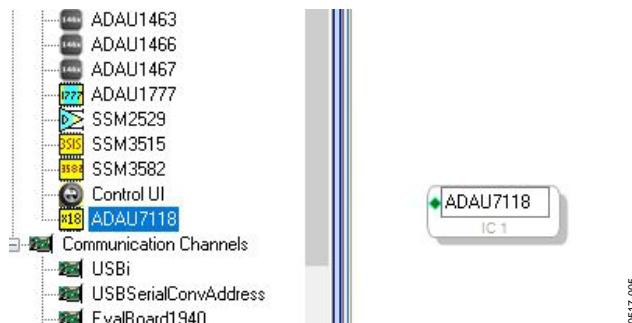
*Figure 14. Adding the **ADAU7118** to the SigmaStudio Project*

2. Next, drag the **USBi** interface from the **Tree Toolbox** the and drop it in the ADAU7118 project.
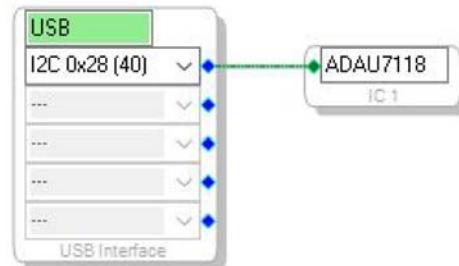
Figure 15. USBi Connection

In the **Hardware Configuration tab**, a tab appears at the bottom of the window for the ADAU7118 register controls (**IC 1 – ADAU17118 Register Controls**). Click this tab to display the register controls for the ADAU7118. There are three pages of controls.

Figure 16 shows the **CHIP ID** pane where the ID registers can be read and displayed.

*Figure 16. **CHIP ID** Pane*

Figure 17 shows the **CLOCK CONTROL** pane of the **Hardware Configuration** tab that displays the registers associated with clocking the ADAU7118.
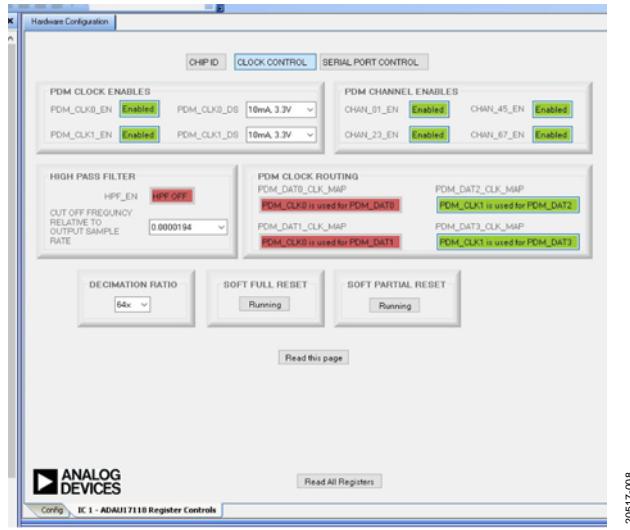
*Figure 17. **CLOCK CONTROL** Pane*

Figure 18 shows the **SERIAL PORT CONTROL** pane of the **Hardware Configuration** tab that displays the serial port controls and the location where channel data appears in the data stream.
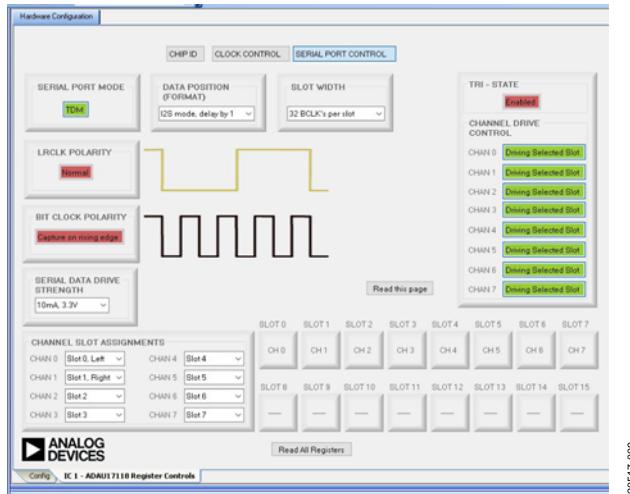
*Figure 18. **SERIAL PORT CONTROL** Pane*

ARWB SOFTWARE INSTALLATION

The ARWB software launches a GUI for direct live control of the ADAU7118 registers. The GUI content for a specific device is defined in a device specific **.xml** file. The ADAU7118 file is not included in the software installation, and is supplied as a download on the ADAU7118 product page.

To install the ARWB software, take the following steps:

1. On the Analog Devices website, run a search for **Automated Register Window Builder, Version 3.2.1**. Click the link that appears in the search results and follow the prompts to download the file.
2. Open the downloaded **ARWB-Installer.zip** file and extract the files to an empty folder on the PC.
3. Double-click the **setup.exe** file and follow the prompts to install the Automated Register Window Builder. It is not required to restart the PC.
4. Copy the **.xml** file for the ADAU7118 from the extraction folder into the folder **C:\ProgramFiles\Analog Devices Inc\AutomatedRegWin**. Alternatively, when the program is opened, navigate to the folder that holds the **.xml** file to load in that file.
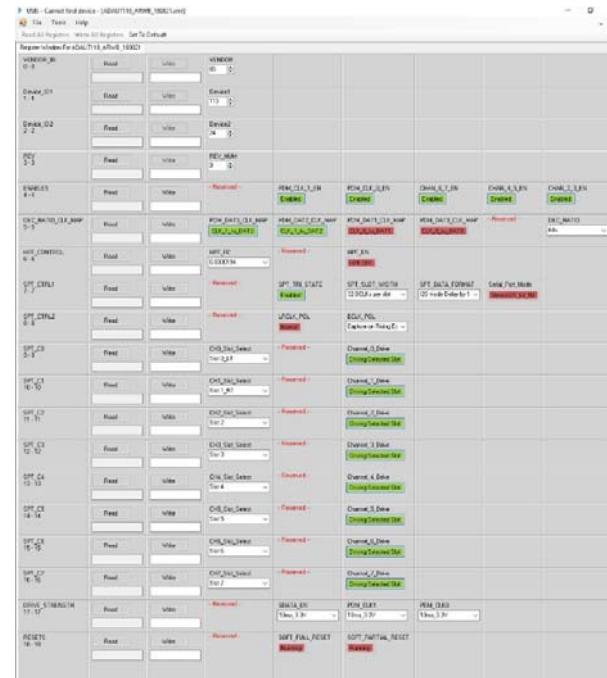
*Figure 19. ARWB Program with **.xml** File Loaded*

EVALUATION BOARD SCHEMATICS AND ARTWORK
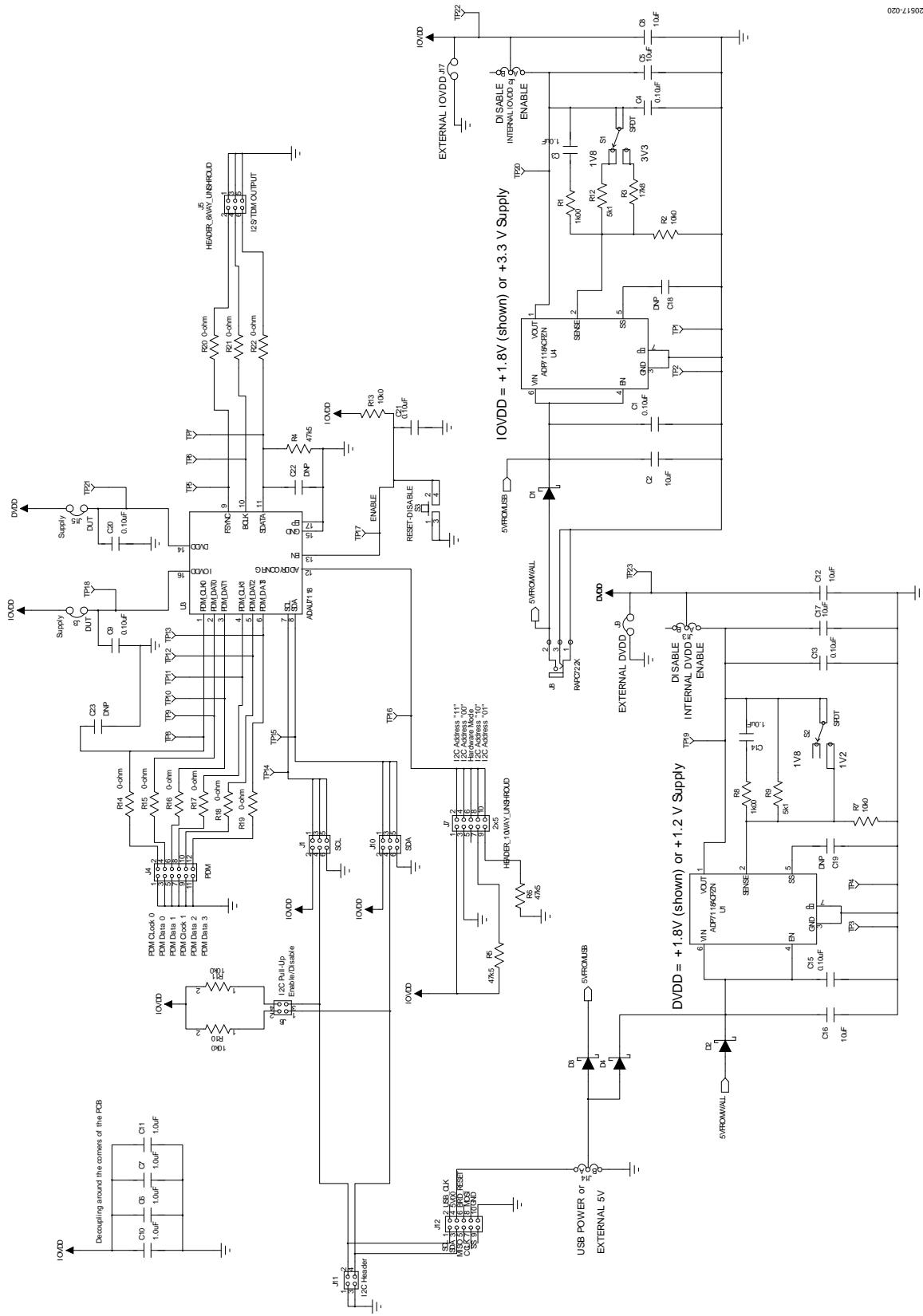
Figure 20. EVAL-ADAU7118 Schematic
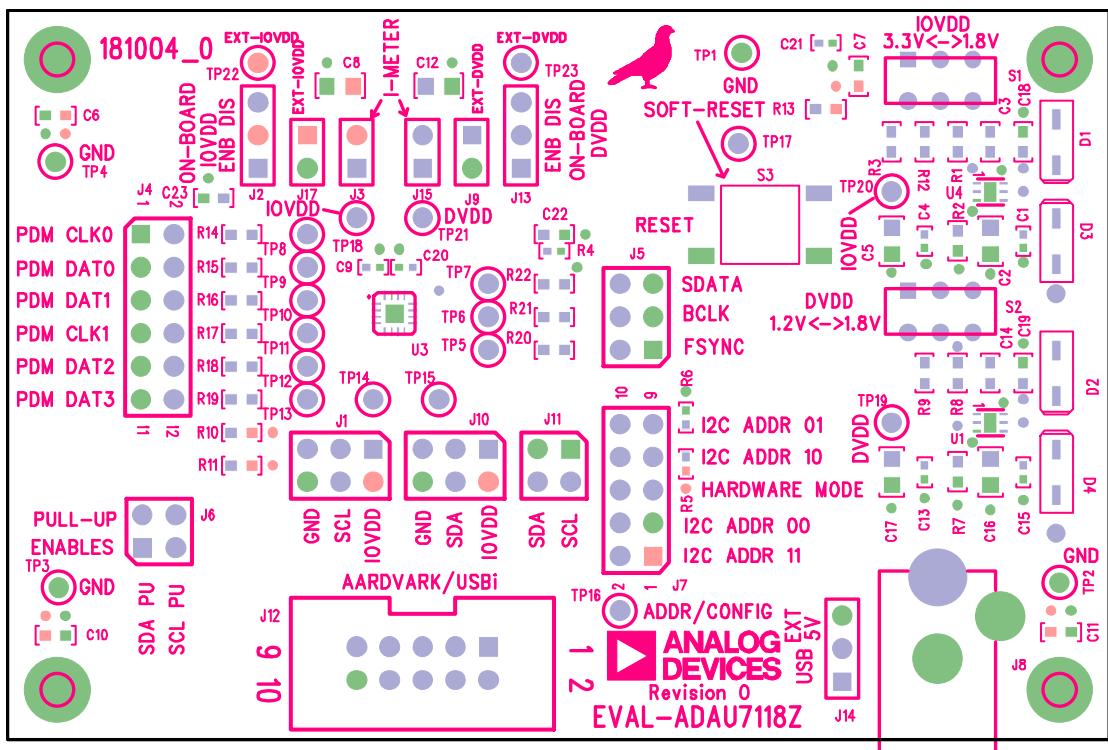
Figure 21. Top Assembly
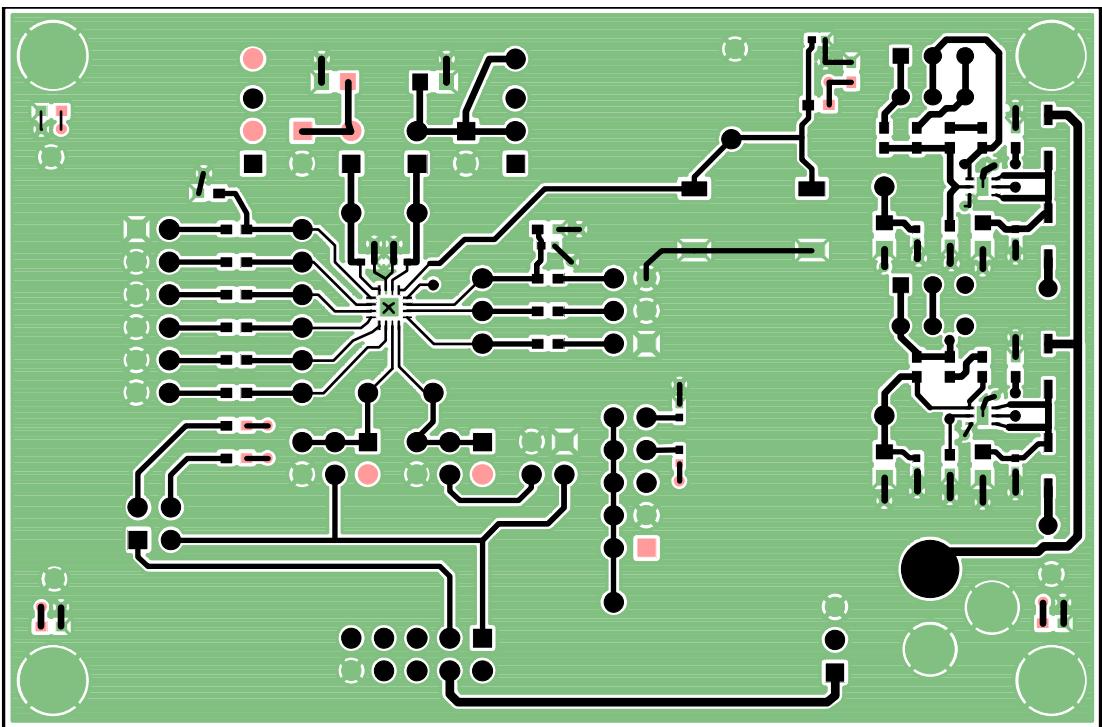

Figure 22. Top Layer, Copper
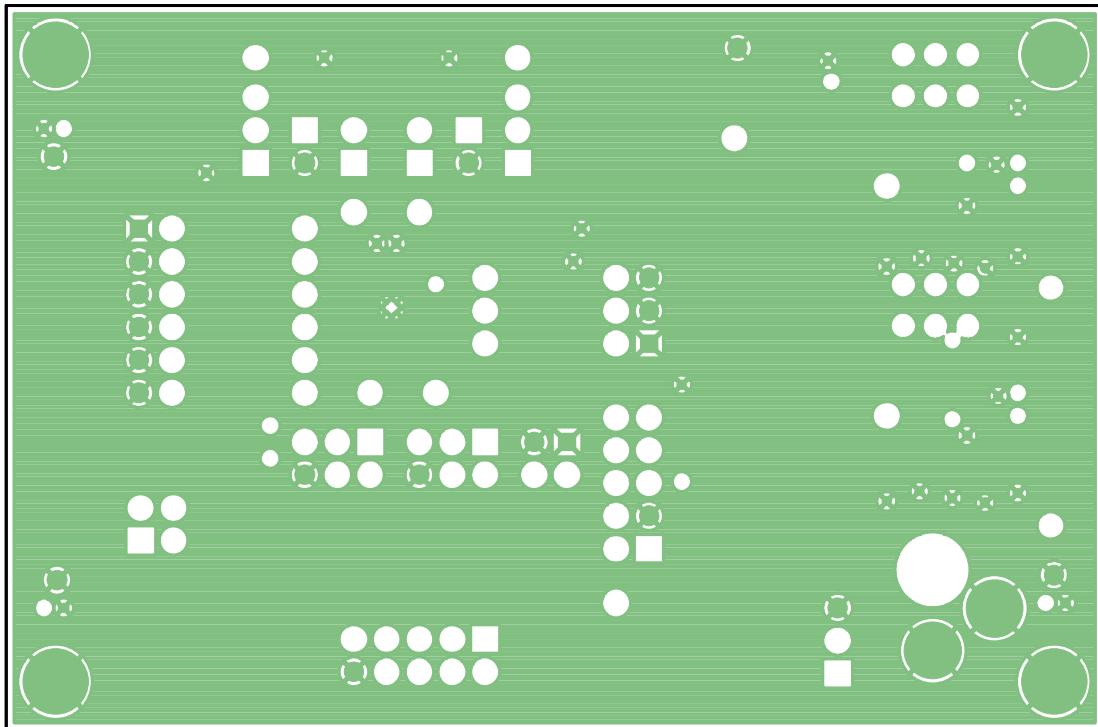
Figure 23. Layer 2, Ground
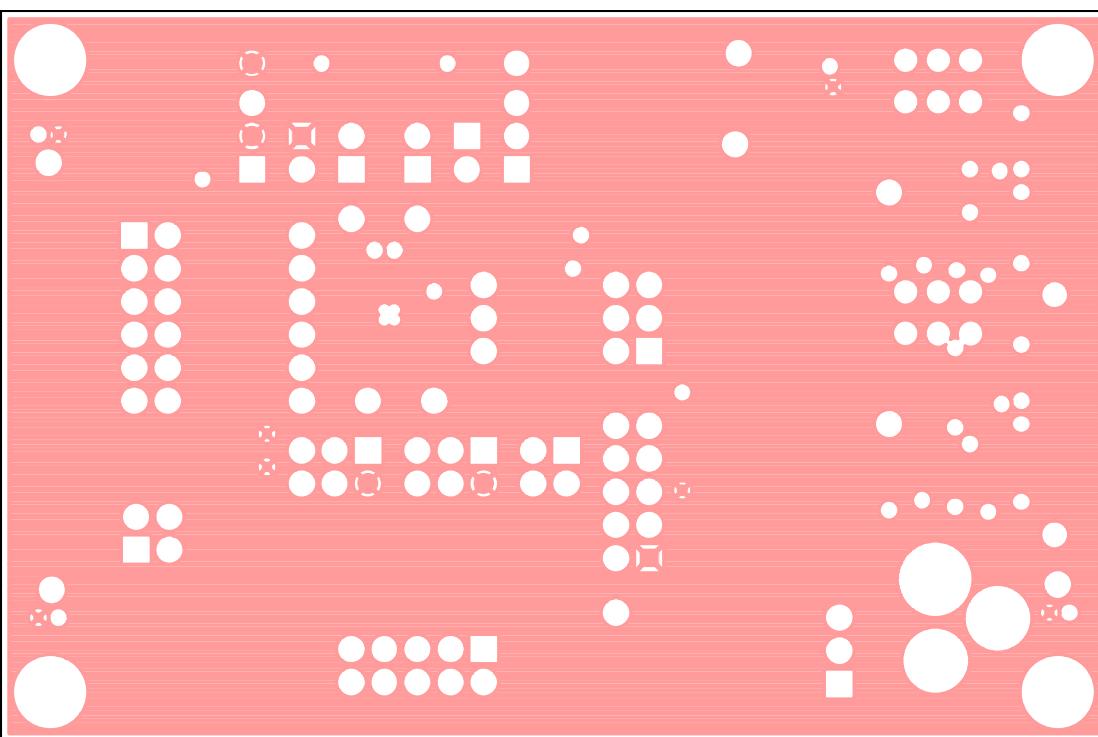
Figure 24. Layer 3, Power
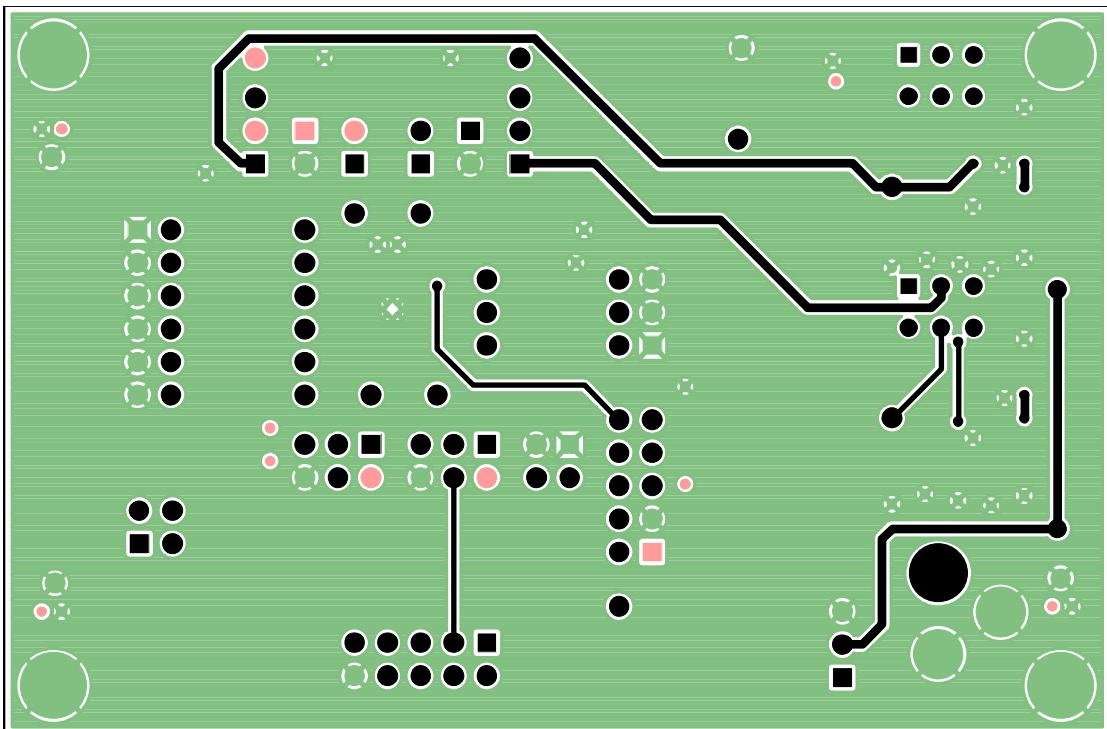
Figure 25. Bottom Layer, Copper
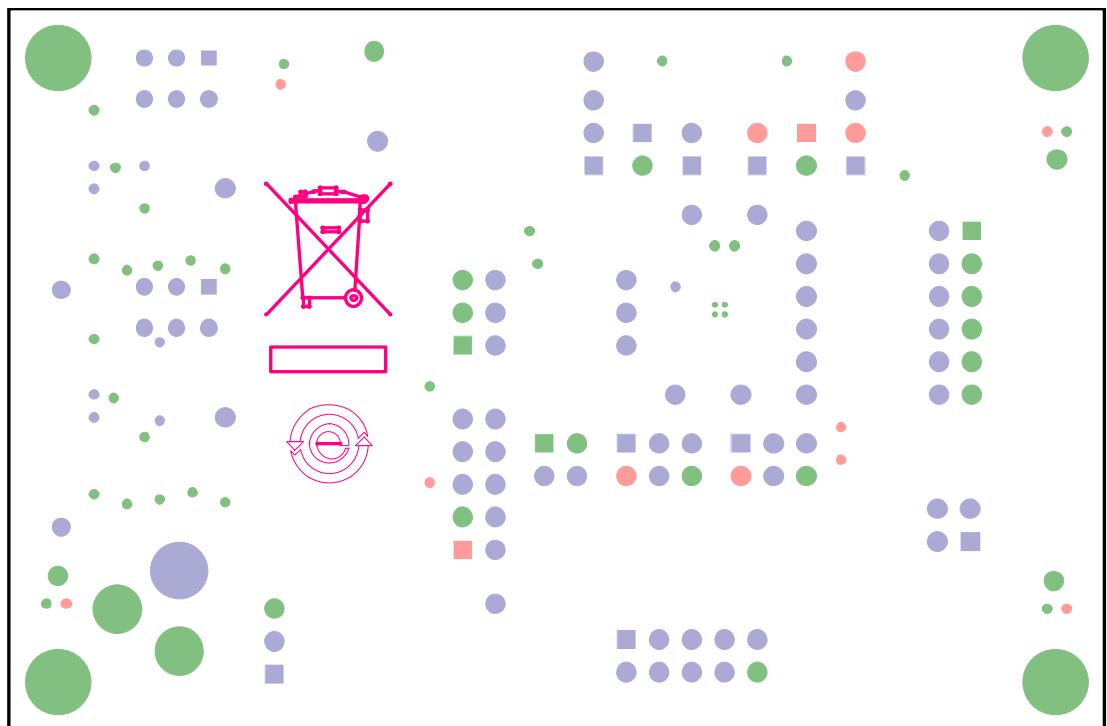
Figure 26. Bottom Assembly

ORDERING INFORMATION

BILL OF MATERIALS

Table 2.

Qty	Reference Designator	Description	Manufacturer	Part Number
7	C1, C4, C9, C13, C15, C20, C21	Multilayer ceramic capacitor (MLCC), 16 V, X7R, 0402	Murata	GRM155R71C104JA88D
6	C2, C5, C8, C12, C16, C17	MLCC, 10 V, X7R, 0805	TDK Corp	C2012X7R1A106K125AC
6	C3, C6, C7, C10, C11, C14	MLCC, 16 V, X7R, 0603	Knowles Novacap	0603BB105K160YT
2	C18, C19	MLCC, 16 V, X7R, 0603	Knowles Novacap	0603BB105K160YT
2	C22, C23	MLCC, 100 V, NP0, 0603	Murata	GRM1885C2A330JA01D
4	D1 to D4	Diode, Schottky, 30 V, 0.5 A SOD123	On Semiconductor	MBR0530T1G
3	J1, J5, J10	Header, unshrouded, 6-way	3M	PBC03DAAN or cut PBC36DAAN
3	J2, J13, J14	Header, SIP, 3-position	Sullins	PBC03SAAN or cut PBC36SAAN
4	J3, J9, J15, J17	Header, unshrouded, 2-way	3M	PBC01DAAN or cut PBC36DAAN
1	J4	Header, unshrouded, 12-way	3M	PBC06DAAN or cut PBC36DAAN
2	J6, J11	Header, unshrouded, 4-way	3M	PBC02DAAN or cut PBC36DAAN
1	J7	Header, unshrouded, 10-way	3M	PBC05DAAN or cut PBC36DAAN
1	J8	Power jack, mini, 0.08 inch, right angled through-hole	Switchcraft, Inc.	RAPC722X
1	J12	Header, polarized, shrouded, 10-way	3M	N2510-6002RB
2	R1, R8	Resistor, thick film, chip, 1%, 125 mW, 0603	Panasonic	ERJ-3EKF1001V
3	R2, R7, R10, R11, R13	Resistor, thick film, chip, 1%, 100 mW, 0603	Panasonic	ERJ-3EKF1002V
1	R3	Resistor, thick film, chip, 1%, 100 mW, 0603	Panasonic	ERJ-3EKF1782V
3	R4 to R6	Resistor, thick film, chip, 1%, 63 mW, 0402, R4 not installed	Stackpole	RMCF0402FT4K75
2	R9, R12	Resistor, thick film, chip, 1%, 100 mW, 0603	Panasonic	ERJ-3EKF5101V
9	R14 to R22	Resistor, thick film, chip, 1%, 100 mW, 0603	Panasonic	ERJ-3GEY0R00V
2	S1, S2	Switch, single-pole, double throw (SPDT), slide, PC mount	E-Switch	EG1271
1	S3	Switch, tact, 6 mm, gull wing	Tyco/Alcoswitch	FSM6JSMA
23	TP1 to TP23	Test point, mini, white, 1 inch	Keystone Electronics	5002
2	U1 to U4	Complementary metal-oxide semiconductor (CMOS) linear dropout (LDO) regulator	Analog Devices, Inc.	ADP7118ACPZN-R7
1	U3	8-Channel Pulse Density Modulation to I²S Converter	Analog Devices	ADAU7118

NOTES

I²C refers to a communications protocol 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.

ANALOG DEVICES

www.analog.com

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Analog Devices Inc.](#):
  [EVAL-ADAU7118Z](#)