

## Evaluating the **ADPD188GG** Optical Module

### FEATURES

Supports the detection of UART

UDP transfer capability

**ADPD188GG** full configuration

Register level

High level

Graph view

Time graph

Frequency graph

### EVALUATION KIT CONTENTS

EVAL-ADPD188GGZ evaluation board

Ribbon cable

### ADDITIONAL EQUIPMENT NEEDED

PC running Windows 7 or Windows 10 operating system

**EVAL-ADPDU CZ** microcontroller board

### ONLINE RESOURCES

**ADPD188GG** data sheet

Applications Wavetool software package

### GENERAL DESCRIPTION

The EVAL-ADPD188GGZ evaluation board provides users with a simple means of evaluating the **ADPD188GG** optical module for vital signs monitoring applications. The evaluation system includes the Applications Wavetool graphical user interface (GUI) that provides users with low level and high level configurability, real-time frequency and time domain analysis, and user datagram protocol (UDP) transfer capability so that the evaluation board can easily interface with the development system of the user.

The EVAL-ADPD188GGZ is powered by the ribbon cable from the **EVAL-ADPDU CZ** microcontroller board (obtained separately). The design of the evaluation board is optimized for wrist based photoplethysmography (PPG) measurements.

For additional information on the functionality of the **ADPD188GG**, refer to the **ADPD188GG** data sheet.

### EVAL-ADPD188GGZ EVALUATION BOARD PHOTOGRAPH



Figure 1.

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**REVISION HISTORY**

4/2018—Revision 0: Initial Version

## GETTING STARTED

### INSTALLING THE APPLICATIONS WAVETOOL

Download the Applications Wavetool software package from the EVAL-ADPD188GGZ product page at [www.analog.com/EVAL-ADPD188](http://www.analog.com/EVAL-ADPD188). Unzip the folder and run the Applications Wavetool executable file. Follow the prompts, beginning with the setup window shown in Figure 2 for software installation.



Figure 2. Applications Wavetool Setup Window

### CONNECTING THE EVAL-ADPDU CZ MICROCONTROLLER BOARD AND THE EVAL-ADPD188GGZ EVALUATION BOARD

Connect the USB cable to the EVAL-ADPDU CZ evaluation board, connect the ribbon cable to the EVAL-ADPD188GGZ board, and switch the power switch to the ON position (see Figure 3).

When the USB cable is connected, the second light emitting diode (LED) below the power switch illuminates, indicating that the on-board battery is being charged. When the power switch is turned to the ON position, the LED immediately below the power switch illuminates, indicating that the EVAL-ADPDU CZ microcontroller board is on.

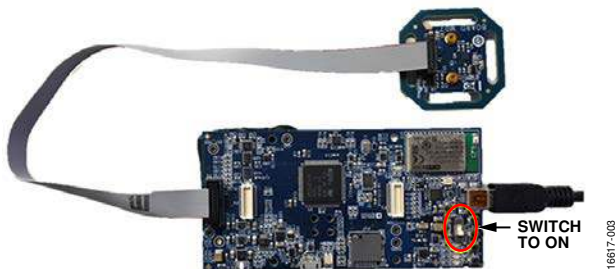


Figure 3. Connect the EVAL-ADPDU CZ to the EVAL-ADPD188GGZ

### CHECKING THE USB SERIAL CONNECTION IN WINDOWS®

Ensure that the COM port driver is installed correctly. To verify proper installation, go to **Control Panel > All Control Panel Items > System > Device Manager**, as shown in Figure 4. In this case, the proper COM port selection is **USB Serial Port (COM16)**.

The EVAL-ADPDU CZ microcontroller board uses an FT232 USB universal asynchronous receiver transmitter (UART) IC. If the USB driver installation does not install properly, refer to the corresponding Future Technology Devices International (FTDI) driver installation guide to the operating system in use.



Figure 4. USB Serial Port in Windows 7

### RUNNING THE APPLICATIONS WAVETOOL

To start the Applications Wavetool application, go to **Start > Analog Devices > ApplicationsWavetool** and click **ApplicationsWavetool**.

### INSTRUCTIONS TO LOAD THE FIRMWARE

The EVAL-ADPDU CZ microcontroller board may have an older version of the firmware installed during manufacture. In this case, the user receives the message shown in Figure 5 when trying to connect to the Applications Wavetool.

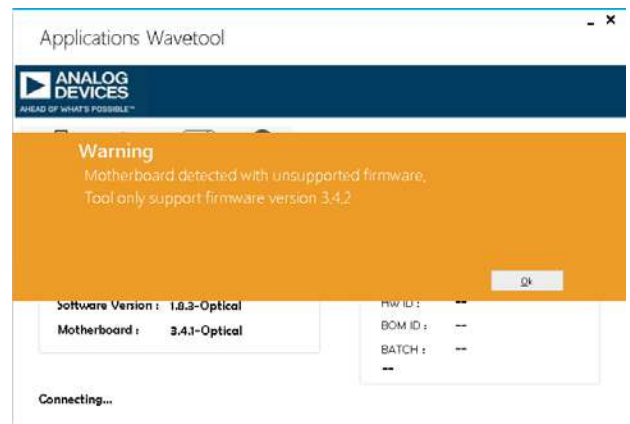


Figure 5. Warning Message for Outdated Firmware

If the firmware must be updated, take the following steps:

1. Download and install the latest DfuSe USB device firmware upgrade software.
2. Plug in a microUSB cable between the EVAL-ADPUCZ and the PC with the power to the EVAL-ADPUCZ turned off (see Figure 6).
3. Press and hold the **BOOT0** button, and switch the power switch to the **ON** position (see Figure 6).

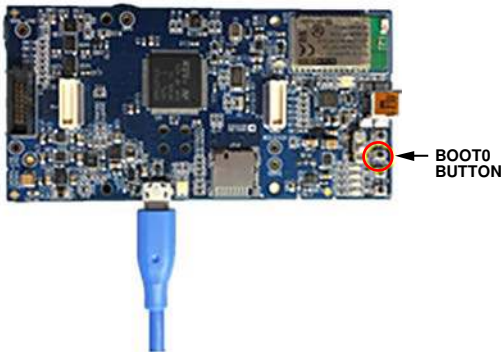


Figure 6. MicroUSB Connection and BOOT0 Button Used When Upgrading Firmware

4. Go to **Device Manager > Universal Serial Bus controllers** and wait until the PC detects **STM Device in DFU Mode** (see Figure 7).

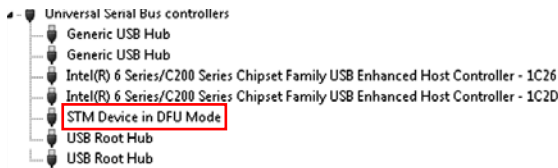


Figure 7. STM Device in DFU Mode Displayed

5. Release the **BOOT0** button.
6. Open the **DfuSe Demo** by going to **Start > All Programs > STMicroelectronics > DfuSe > DfuSe Demo**. Figure 8 shows the **DfuSe demo** settings at startup.
7. In the **Upgrade or Verify Action** section, click **Choose**, and select the **Adpd\_M4\_uC.dfu** file from the **Firmware** folder of the downloaded software package.
8. Click **Upgrade** and follow the prompts to upgrade the firmware of the EVAL-ADPUCZ microcontroller board.

After the firmware is updated, connection to the Applications Wavetool can be completed.

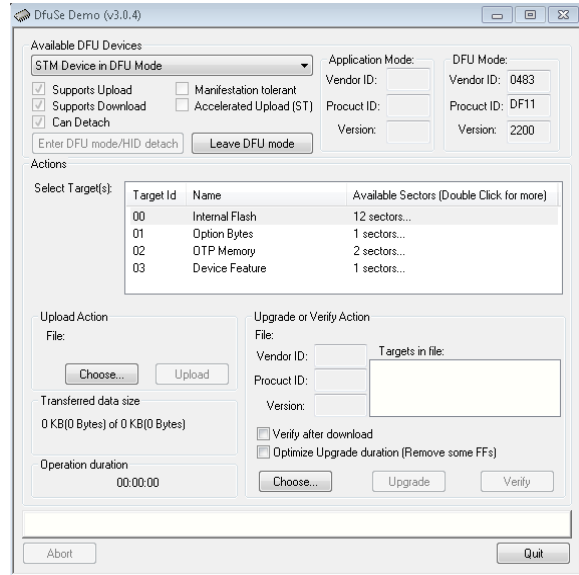


Figure 8. DfuSe Demo Settings

### USB UART CONNECTION

To establish the connection, follow the menu path **Connection > Connect > UART Bridge**.

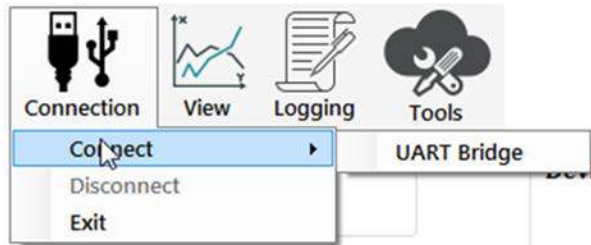


Figure 9. UART Connect

Select the proper COM port to connect the Applications Wavetool to the device. If connection via Bluetooth® is required, or if there are any other connection issues, refer to the Applications Wavetool user guide that is provided in the software package download.

## ACQUIRING DATA

### SELECTING THE PROPER VIEW

The EVAL-ADPD188GGZ is intended for wrist-based PPG measurements. Select the **ADPD Device** data view (see Figure 10). This view opens a window that allows the user to run the **ADPD188GG** device and collect data (see Figure 12).

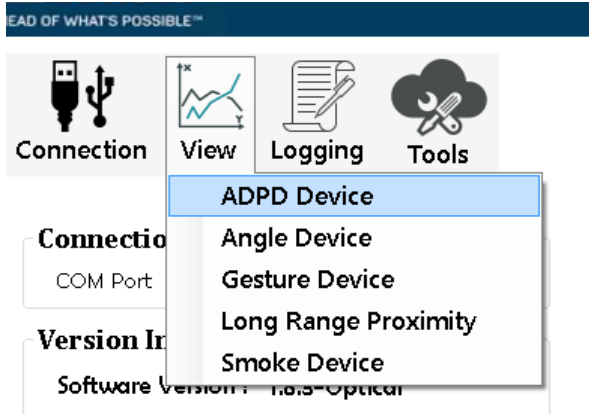


Figure 10. Select **ADPD Device**

### LOAD CONFIGURATION

In the upper right corner of the data view window, click the **ADPD Config** button to open the **ADPD Config** view (see Figure 11). Click **Load DCFG** to select a configuration file. For PPG measurements, select the **ADPD188Normal.dcfg** configuration file.

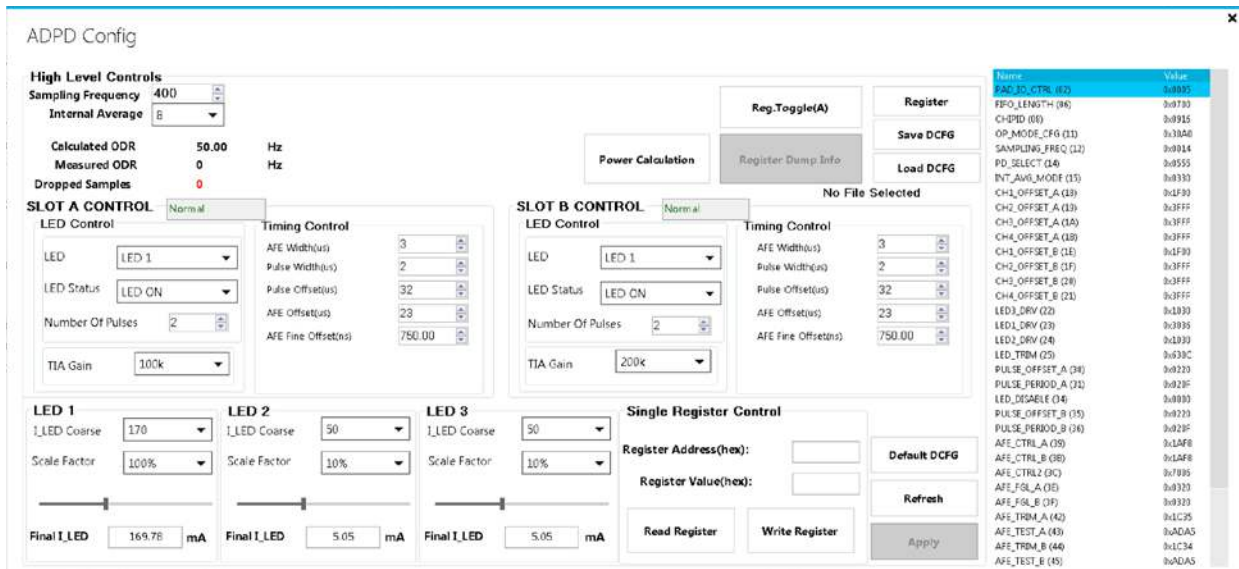


Figure 11. **ADPD Config** View

**OPTIMIZING AND RUNNING THE ADPD188GG**

After the configuration file is loaded, the settings can be further optimized using the **ADPD Config** window shown in Figure 11. Typically, the device is set up under some set of conditions, for example, measuring the response from a fixed reflector or measuring a PPG signal from the wrist (see Figure 12). Settings can be optimized for any set of conditions by manipulating LED drive currents, transimpedance amplifier (TIA) gain, and

analog front end (AFE) timing or by using different operating modes that may be more optimal for a specific set of conditions, for example, using float mode for very low current transfer ratio (CTR). For information on optimization of the **ADPD188GG**, refer to the **ADPD188GG** data sheet. For functional descriptions of the Applications Wavetool, refer to the Applications Wavetool user guide that is provided in the software package download.

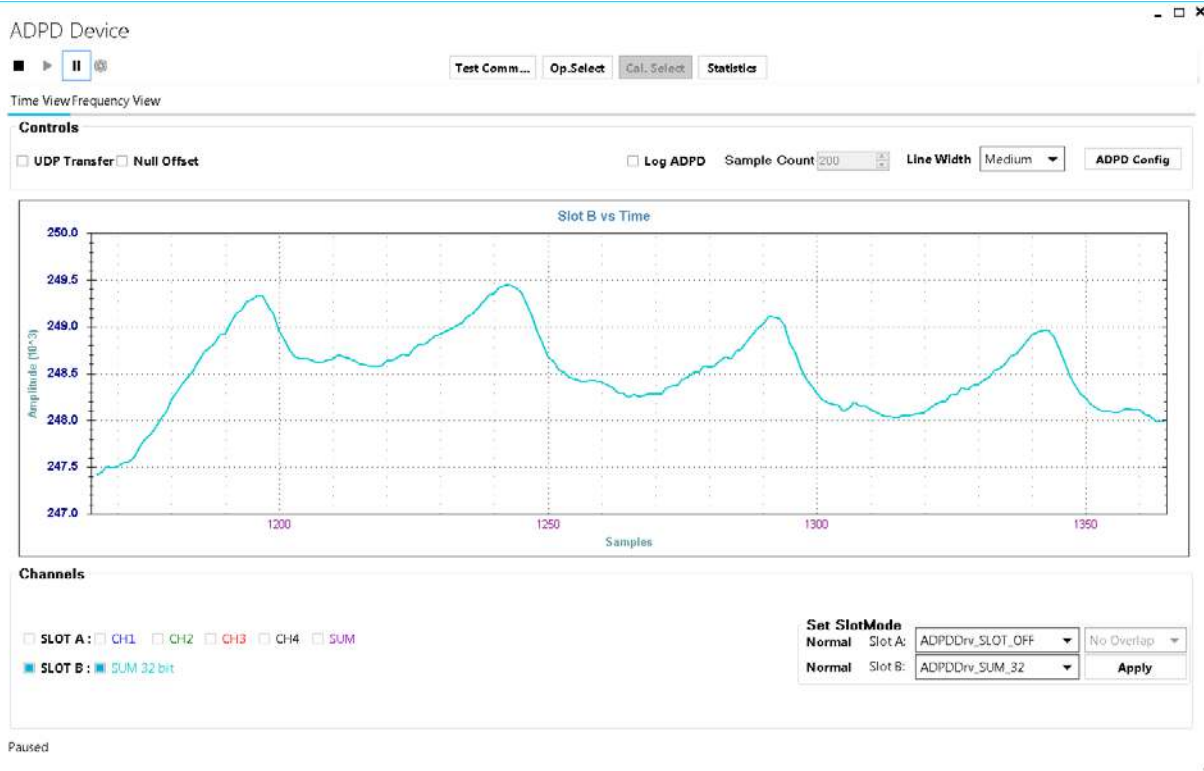


Figure 12. Example of a PPG Signal Measured from the Wrist

EVALUATION BOARD SCHEMATIC AND ARTWORK

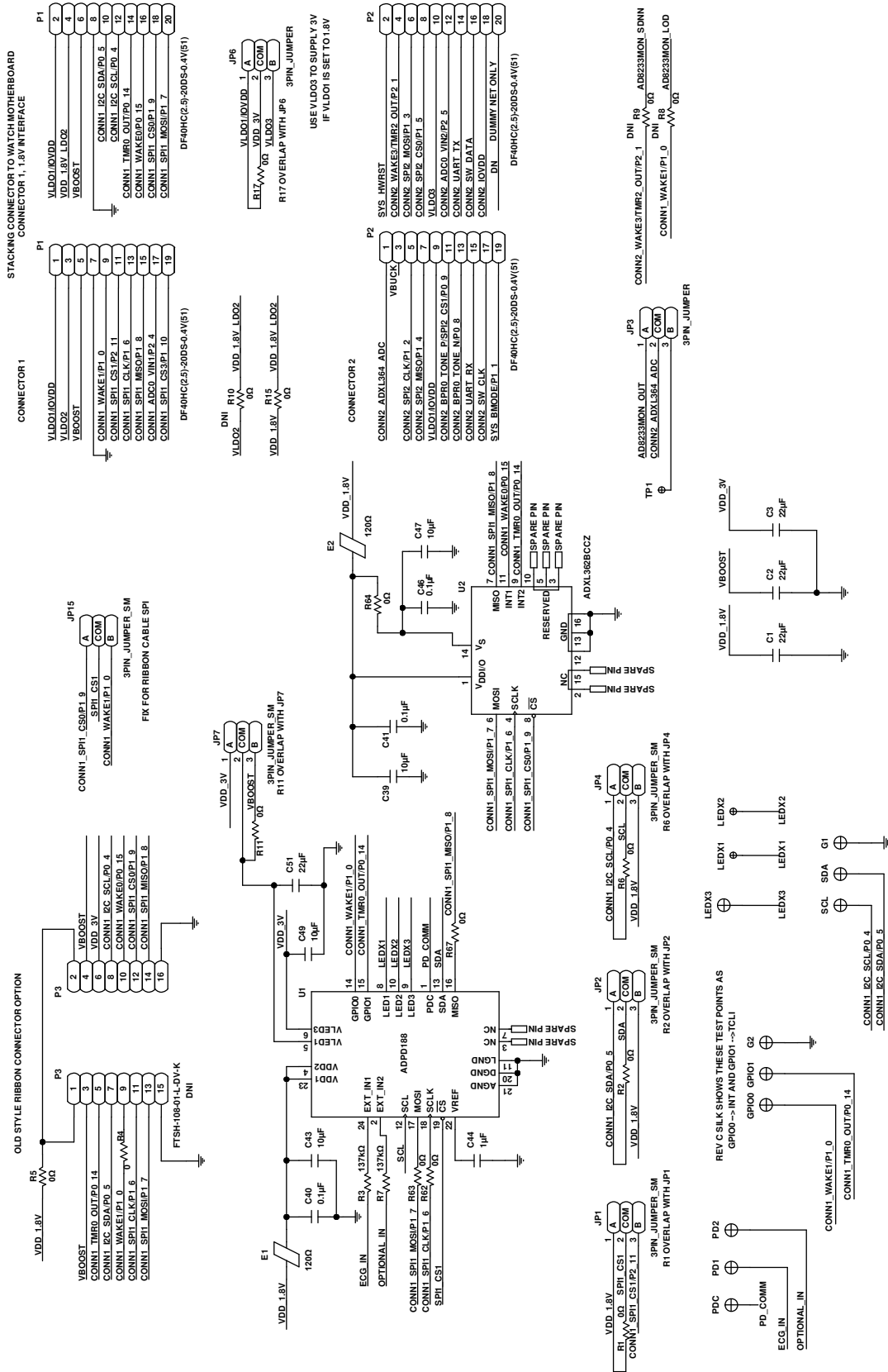


Figure 13. EVAL-ADPD188GGZ Schematic

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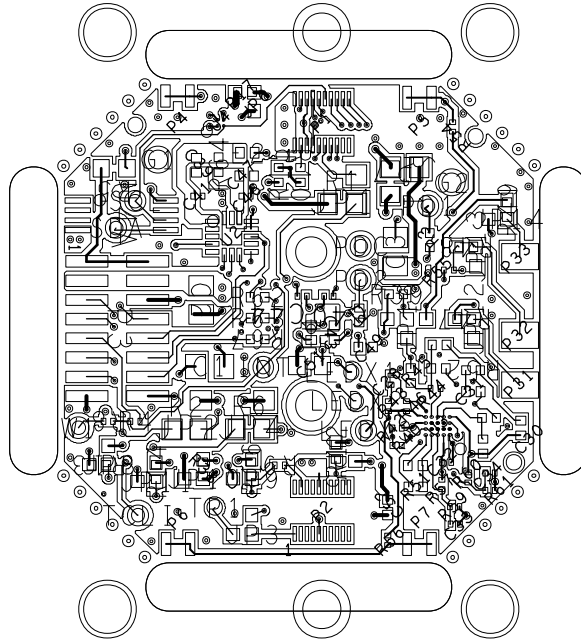


Figure 14. EVAL-ADPD188GGZ Primary Layer

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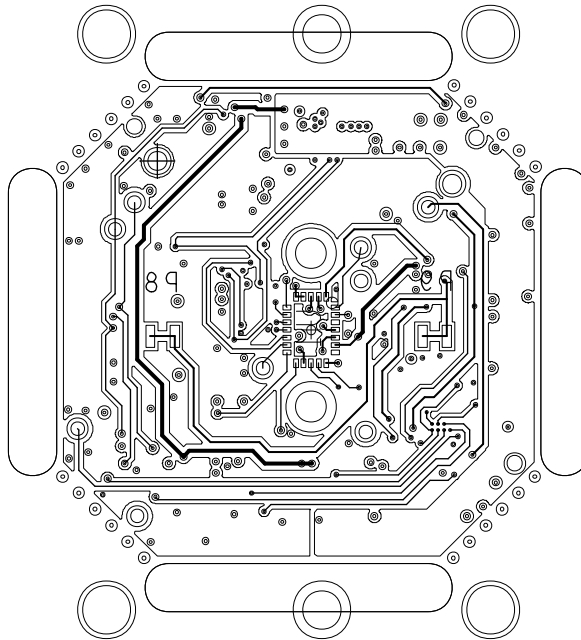


Figure 15. EVAL-ADPD188GGZ Secondary Layer

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## NOTES

**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.

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