EVAL-ADPD188BIZ-SK User Guide

UG-1274

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Evaluating the ADPD188BI Optical Module

FEATURES

- Supports the detection of UART
- UDP transfer capability
- Full configuration of the ADPD188BI
  - Register level
  - High level
- Graph view
  - Time graph
  - Frequency graph

EVALUATION KIT CONTENTS

- EVAL-ADPD188BIZ-SK evaluation board
- Ribbon cable

ADDITIONAL EQUIPMENT NEEDED

- PC running Windows 7 or Windows 10 operating system
- EVAL-ADPDUCZ microcontroller board

ONLINE RESOURCES

- ADPD188BI data sheet
- Applications WaveTool software package

GENERAL DESCRIPTION

The EVAL-ADPD188BIZ-SK evaluation board provides users with a simple means of evaluating the ADPD188BI optical module for smoke and aerosol detection applications. The evaluation system includes the Applications WaveTool graphical user interface (GUI), providing 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 to the user development system.

The EVAL-ADPD188BIZ-SK is powered through the ribbon cable from the EVAL-ADPDUCZ microcontroller board, obtained separately.

For additional information on the functionality of the ADPD188BI, refer to the ADPD188BI data sheet.

EVALUATION BOARD PHOTOGRAPH

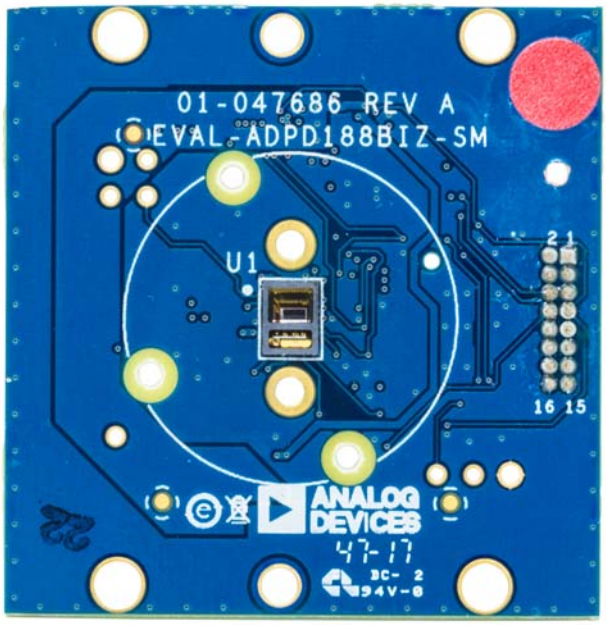

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Figure 1.

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REVISION HISTORY

6/2018—Revision 0: Initial Version

GETTING STARTED

INSTALLING THE APPLICATIONS WAVETOOL

Download the Applications WaveTool software package from the EVAL-ADPD188BIZ-SK product page. Unzip the folder and run **Applications_WaveToolx_x_x.exe**. Follow the prompts for software installation, beginning with the setup window shown in Figure 2.

Figure 2. Applications WaveTool Setup Window

CONNECTING THE EVAL-ADPDUCZ MICROCONTROLLER BOARD AND THE EVAL-ADPD188BIZ-SK EVALUATION BOARD

Connect the USB cable to the EVAL-ADPDUCZ evaluation board, connect the ribbon cable to the EVAL-ADPD188BIZ-SK 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-ADPDUCZ microcontroller board is on.

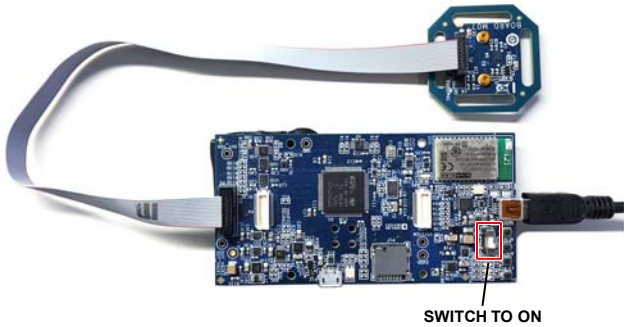

Figure 3. Connecting the EVAL-ADPDUCZ to the EVAL-ADPD188BIZ-SK

CHECKING THE USB SERIAL CONNECTION IN WINDOWS

Ensure that the COM port driver is installed correctly. To verify proper installation of the COM port driver, 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-ADPDUCZ 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 FTDI driver installation guide that is compatible with the operating system being used.

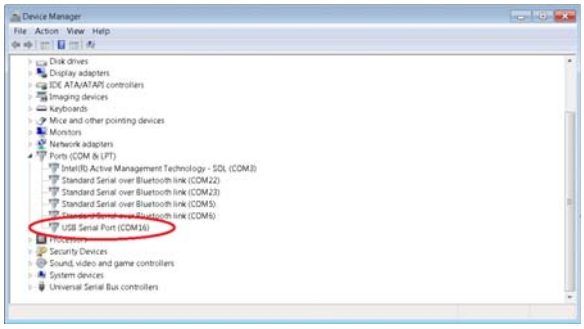

Figure 4. USB Serial Port in Windows® 7

The EVAL-ADPDUCZ also contains a Bluetooth® radio that can be paired with the PC if a wireless connection is desired.

RUNNING THE APPLICATIONS WAVETOOL

To start the Applications WaveTool application, navigate to the **Start** menu > **Analog Devices** > **ApplicationsWaveTool** and click **ApplicationsWaveTool.**

INSTRUCTIONS TO LOAD THE FIRMWARE

It is possible that the EVAL-ADPDUCZ microcontroller board is loaded with an older version of the firmware at the time that it was stocked. In this scenario, the user receives the message shown in Figure 5 when attempting to connect to the WaveTool.

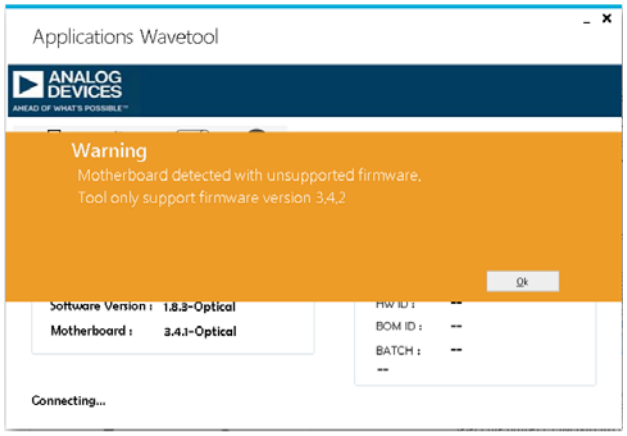

Figure 5. Warning Message for Outdated Firmware

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 micro USB cable between the EVAL-ADPDUCZ and the PC with the power to the EVAL-ADPDUCZ turned off (see Figure 6).
3. Press and hold the **BOOT0** button, and switch the power switch to the **ON** position

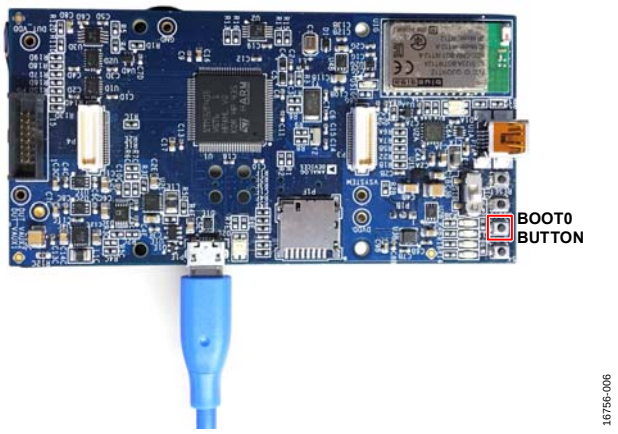

*Figure 6. Micro USB Connection and **BOOT0** Button Used when Upgrading Firmware*

4. Go to **Device Manager** > **Universal Serial Bus controllers** and wait until the PC detects **STM Device in DFU Mode** (see Figure 7). If the PC does not detect the STM device in DFU mode, then the STM drivers must be manually installed to continue updating the firmware.

*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. Click the **Choose** button from the **Upgrade or Verify Action** window and select **Adpd_M4_uC.dfu** from the **Firmware** folder of the downloaded software package.
8. Click the **Upgrade** button and follow the prompts to upgrade the firmware of the EVAL-ADPDUCZ microcontroller board.

After the firmware updates, connection to the WaveTool completes.

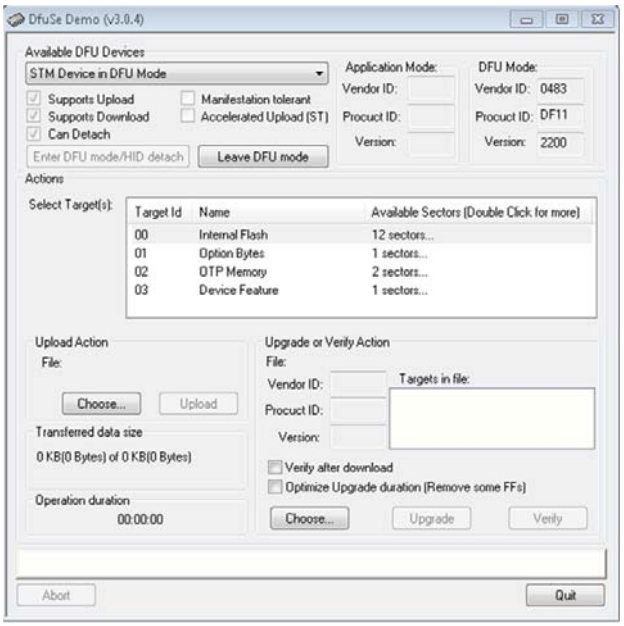

*Figure 8. **DfuSe** Demo Settings*

USB UART CONNECTION

To establish the USB UART connection, use the following menu path**: Connection** > **Connect** > **UART Bridge**.

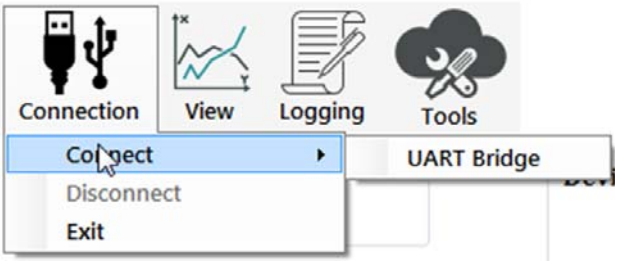

Figure 9. UART Connection

Select the proper COM port to connect the 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-ADPD188BIZ-SK is intended for smoke and aerosol detection applications. Select the **Smoke Device** data view (see Figure 10) to open a window that allows the user to run the ADPD188BI device and to collect data (see Figure 19).

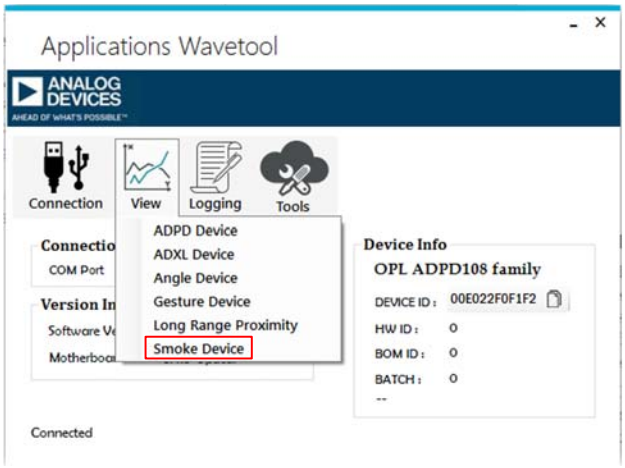

*Figure 10. Selecting the **Smoke Device** Data View*

LOAD CONFIGURATION

In the upper right corner of the data view window, click the **ADPD Config** button (see Figure 11) to open the **Configuration** window.

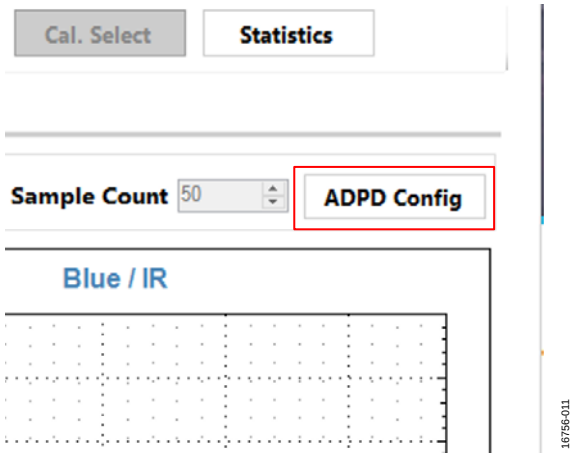

*Figure 11. Selecting **ADPD Config** to the Open the **Configuration** Window*

In the **Configuration** window, click **Load DCFG** to select a configuration file, as shown in Figure 12. For smoke and aerosol measurements, select the **ADPD188BI_SK.dcfg** configuration file from the file dialog box.

*Figure 12. Selecting **Load DCFG** to Select the Configuration File*

OPTIMIZING AND RUNNING THE ADPD188BI

Using the **ADPD188BI_SK.dcfg** configuration file, the ADPD188BI is set up with an infrared (IR) LED firing in Time Slot A and the blue LED firing in Time Slot B. The initial configuration is as shown in Figure 18. Before running the Applications WaveTool, a few steps must be taken to optimize the data collection view and provide valid blue/IR ratios.

1. In the data view (see Figure 19), click the **Op Select** button to open the view shown in Figure 13. Select **SB_Sum**, **SA_Sum**, and the / operation, as shown in Figure 13, to configure the blue/IR ratio in the data view.

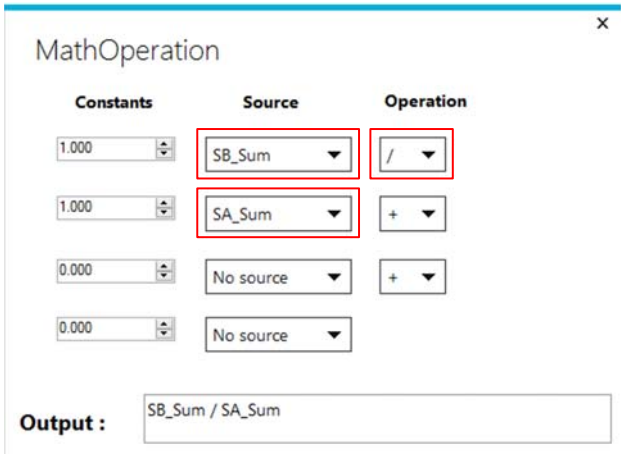

*Figure 13. **Op Select** View*

2. Before running the WaveTool, make sure the operating mode shown in the **Set SlotMode** window of the data view is set to **ADPDDrv_SUM_32** for both Time Slot A and Time Slot B, as shown in Figure 14.

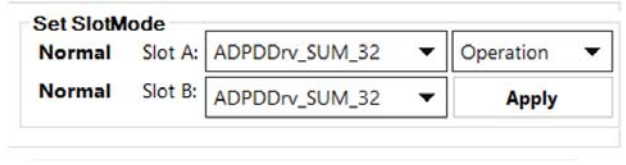

*Figure 14. Selecting **ADPDDrv_SUM_32***

3. With the sensor board in a fixed position and no aerosol or smoke in the optical path, run the WaveTool by pressing the play button. The raw data view, **Slot A/B vs Time**, must be at some average level. This average level must be nulled out before measuring smoke or aerosol, as described in the following steps (Step 4 to Step 6).

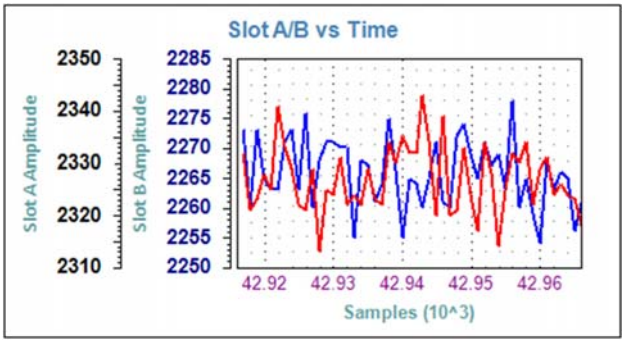

Figure 15. Average Value Prior to Nulling Offset

4. Open the **Statistics** window by clicking the **Statistics** button in the data view.
5. In the **Statistics** window, select **Continuous Update**. Allow the **Statistics** window to calculate the mean value. After a mean value is calculated, click the **Subtract mean from Offsets** button.

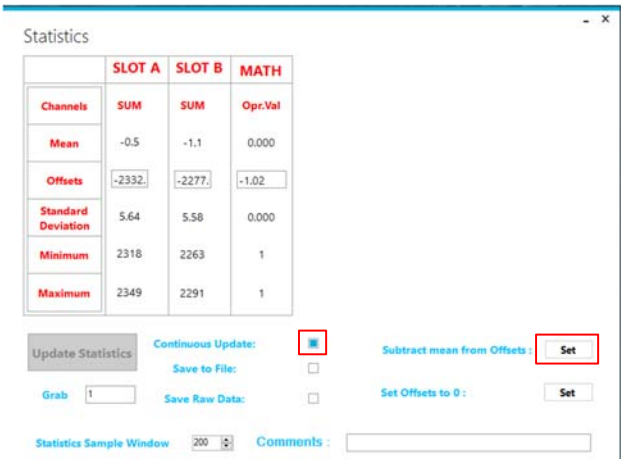

*Figure 16. **Statistics** Window*

6. In the data view, click the **Null Offset** button to set the Time Slot A and Time Slot B raw data values to approximately zero, plus or minus the noise that may be present (see Figure 17).

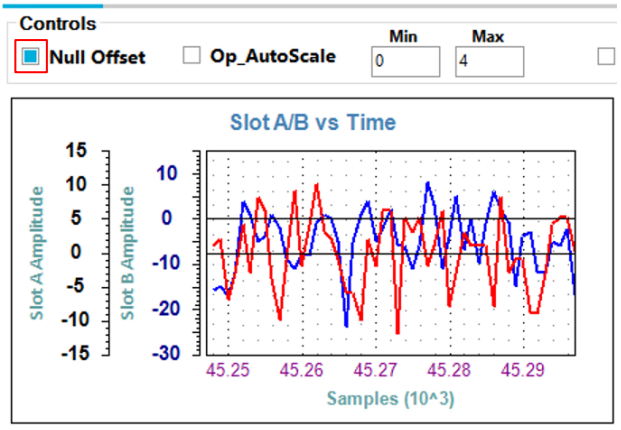

*Figure 17. Data View Following **Null Offset***

After these steps are complete, the user can begin testing with different aerosols. Figure 19 shows the raw output data, as well as the blue/IR ratio of the response to a jet of smoke spray. The **EN_MW** button can be pressed to enable an eight point moving average filter on the data being plotted.

The settings can be further optimized by manipulating the LED drive currents, the transimpedance amplifier (TIA) gain, the number of pulses, and the decimation rate until the desired signal-to-noise ratio (SNR) is obtained from the response to the smoke or aerosol being detected. For information about optimizing the ADPD188BI, refer to the ADPD188BI data sheet. For functional descriptions of the Applications WaveTool, refer to the Applications WaveTool user guide provided in the software package download.

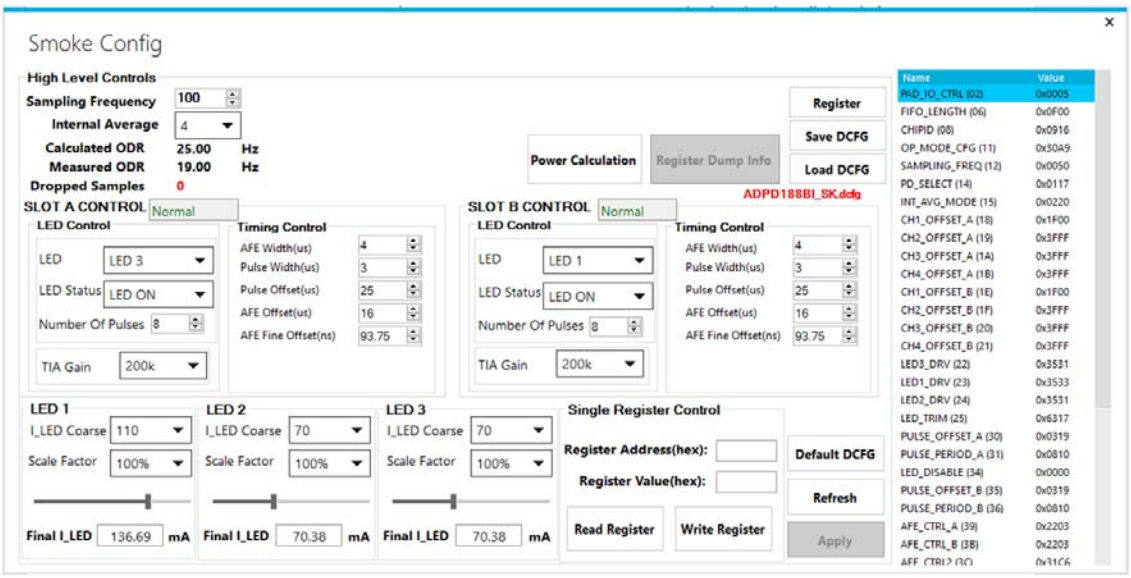

*Figure 18. Smoke Device Configuration (**Smoke Config**) View*

Figure 19. Raw Data Response and Blue/IR Ratio Measurement of Smoke Spray

EVALUATION BOARD SCHEMATICS AND ARTWORK

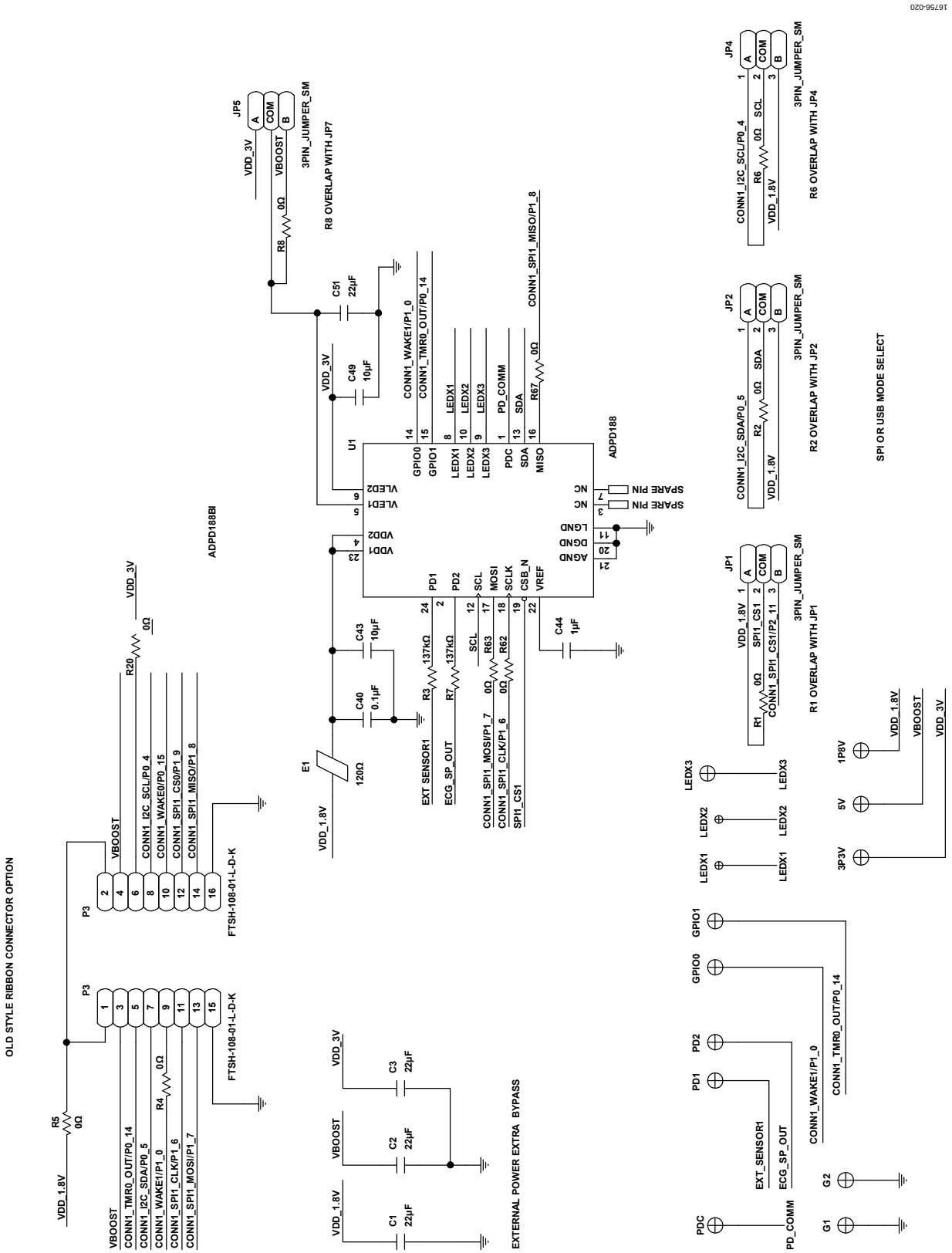

Figure 20. EVAL-ADPD188BIZ-SK Schematic, Page 1

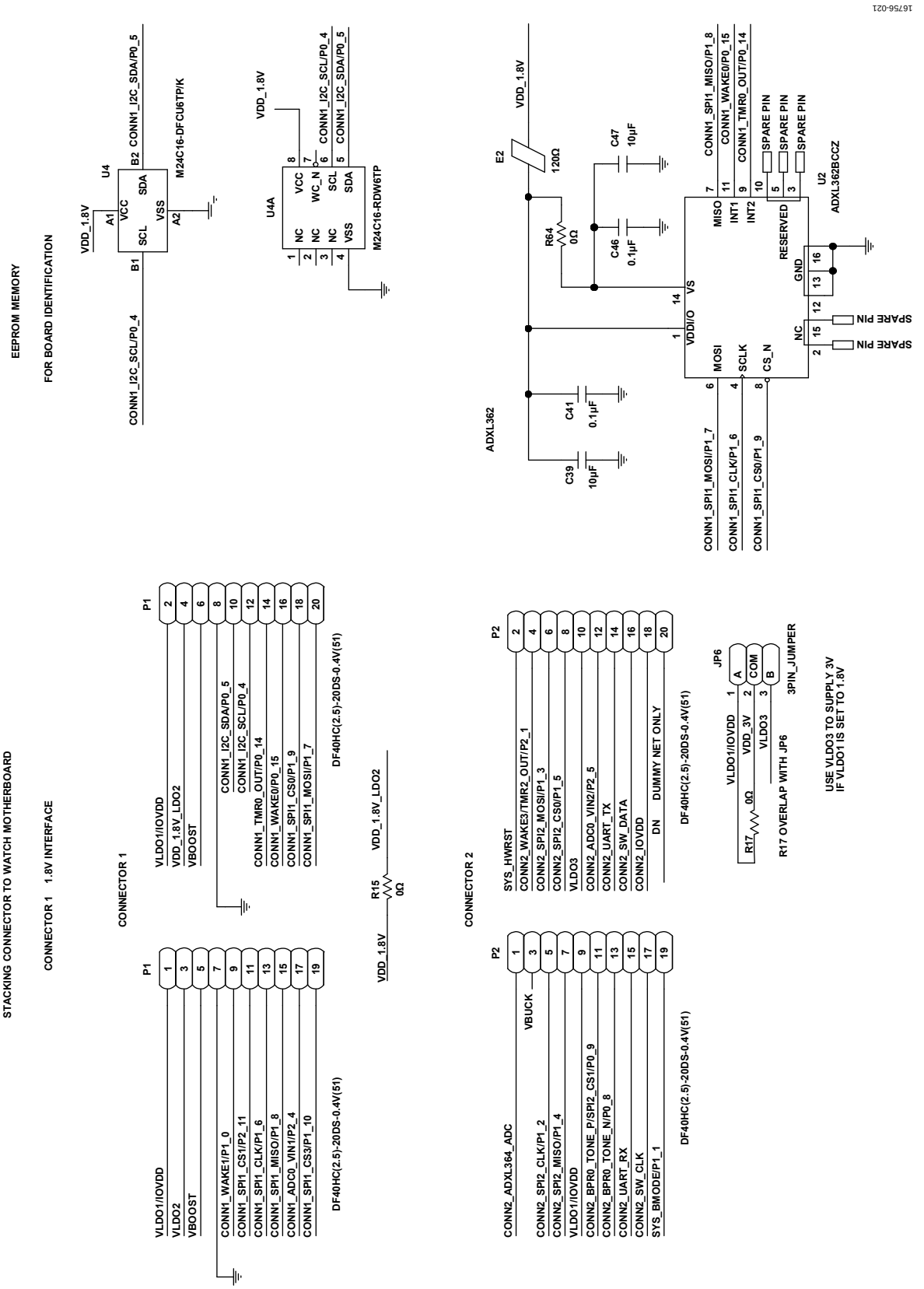

Figure 21. EVAL-ADPD188BIZ-SK Schematic, Page 2

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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