User's Guide

TPA6404-Q1 Evaluation Module

ABSTRACT

This manual describes the operations of the TPA6404Q1AEVM. The TPA6404Q1AEVM is a stand-alone EVM. The PurePath™ Control Console 3 GUI (PPC3) is used to initialize and operate the EVM. The main topics of this document are:

- Hardware implementation and descriptions
- Software implementation and descriptions
- TPA6404 EVM operations (hardware and software)

Required equipment and accessories:

1. TPA6404 EVM
2. USB A male to micro B male cable
3. *Power Supply Unit* (PSU) up to 18 V, 6-A capable
4. 1–4 resistive loads or speaker loads
5. 8 pairs of wires stripped both ends
6. 2-mm slotted screwdriver
7. Desktop or laptop PC with Microsoft® Windows® 7 OS
8. Access to the internet for downloading software

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1 Trademarks

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2 Hardware Overview

2.1 TPA6404Q1 Evaluation Module Description

The TPA6404Q1 EVM can operate as a stand-alone EVM. USB adapter is provided for a more thorough evaluation of the device. Figure 2-1 shows the EVM board.

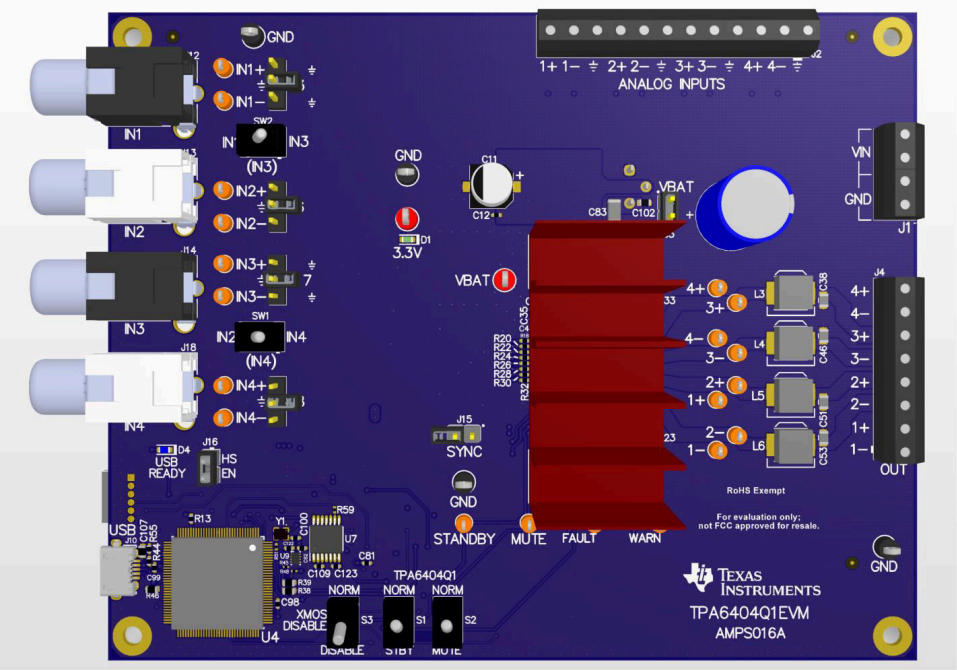

Figure 2-1. TPA6404Q1 EVM

Figure 2-2 shows the TPA6404E1 EVM signal flow:

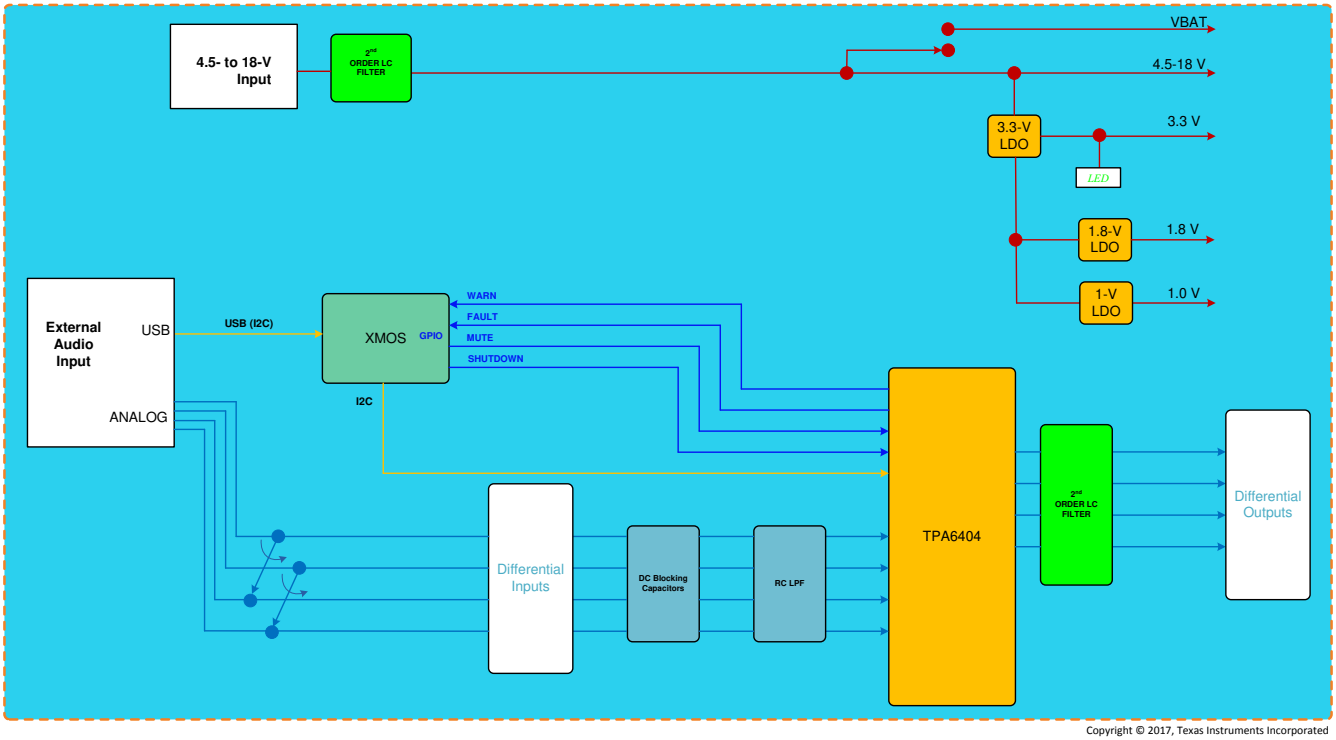

Figure 2-2. EVM Block Diagram

3 Software Overview

3.1 PurePath™ Console 3 (PPC3) Access and Description

PPC3 is a server-based tool. Request access at http://www.ti.com/tool/PUREPATHCONSOLE.

Once approval is given, download the software from www.ti.com/mysecuresoftware.

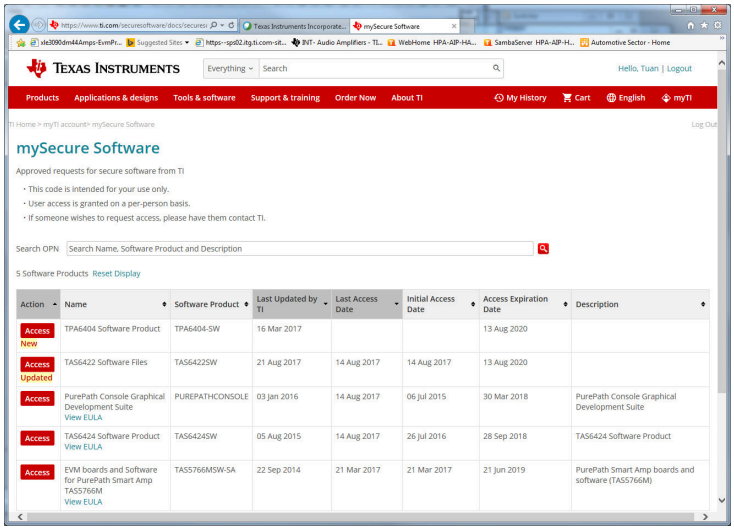

Figure 3-1. PPC3 Download Window

Run the installation program. Also download the PPC3 User Manual (slou408) for further instructions.

Figure 3-2 shows the window displayed when first running PPC3.

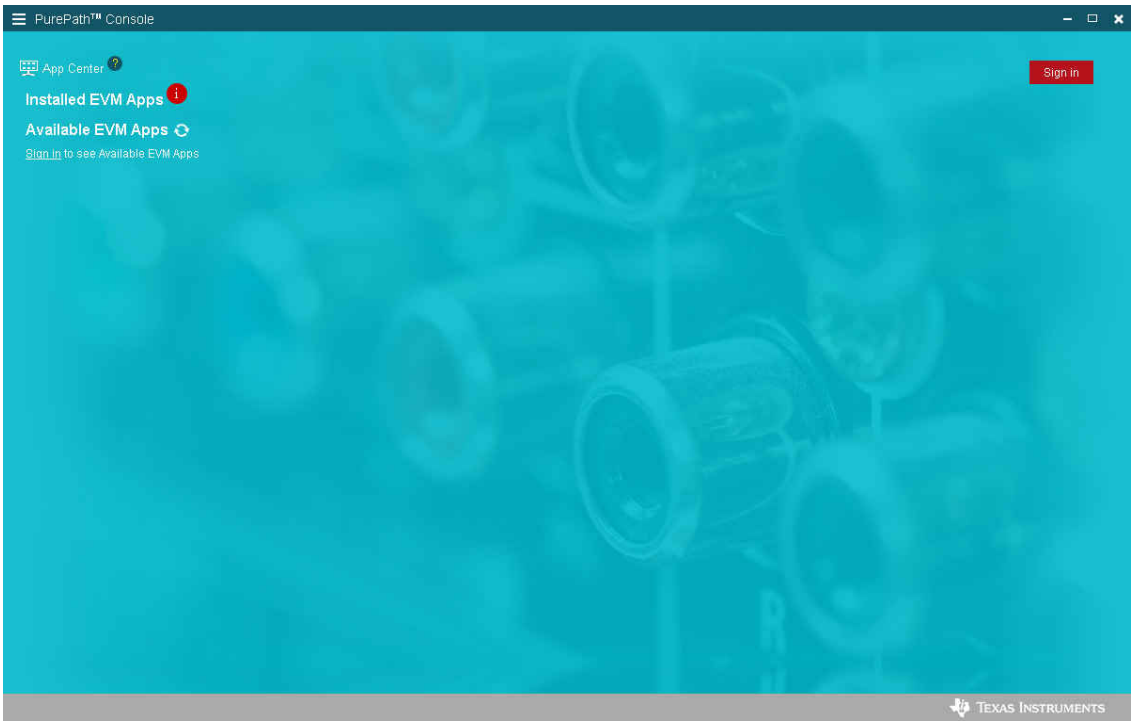

Figure 3-2. PPC3 Window

When the window in Figure 3-2 is displayed, click on “sign in” to see TPA6404 EVM application. All of the Apps in Figure 3-3 may not be displayed for you.

Figure 3-3. Available Apps Window

Click the TPA6404 App box to download the TPA6404 application. An *Installation* window pops up, next click **Install**.

The TPA6404 EVM box appears in the *Installed EVM Apps* section, see Figure 3-3. Click on the TPA6404 box to launch the TPA6404 App. There are three windows available with the TPA6404 EVM PPC3: *Home Window*, *Register Map Window*, and *Device Monitor & Control Window*.

3.2 PurePath™ Console 3 – TPA6404 EVM Home Window

When the TPA6404 EVM PPC3 is launched, the *Home Window* displays (see Figure 3-4). If the EVM is powered on and the USB is connected to the PC, the *Home Window* displays the *Connect* box in the bottom right hand corner. If the EVM is not powered on or the USB is not connected, only *TPA6404 EVM – Offline* is displayed.

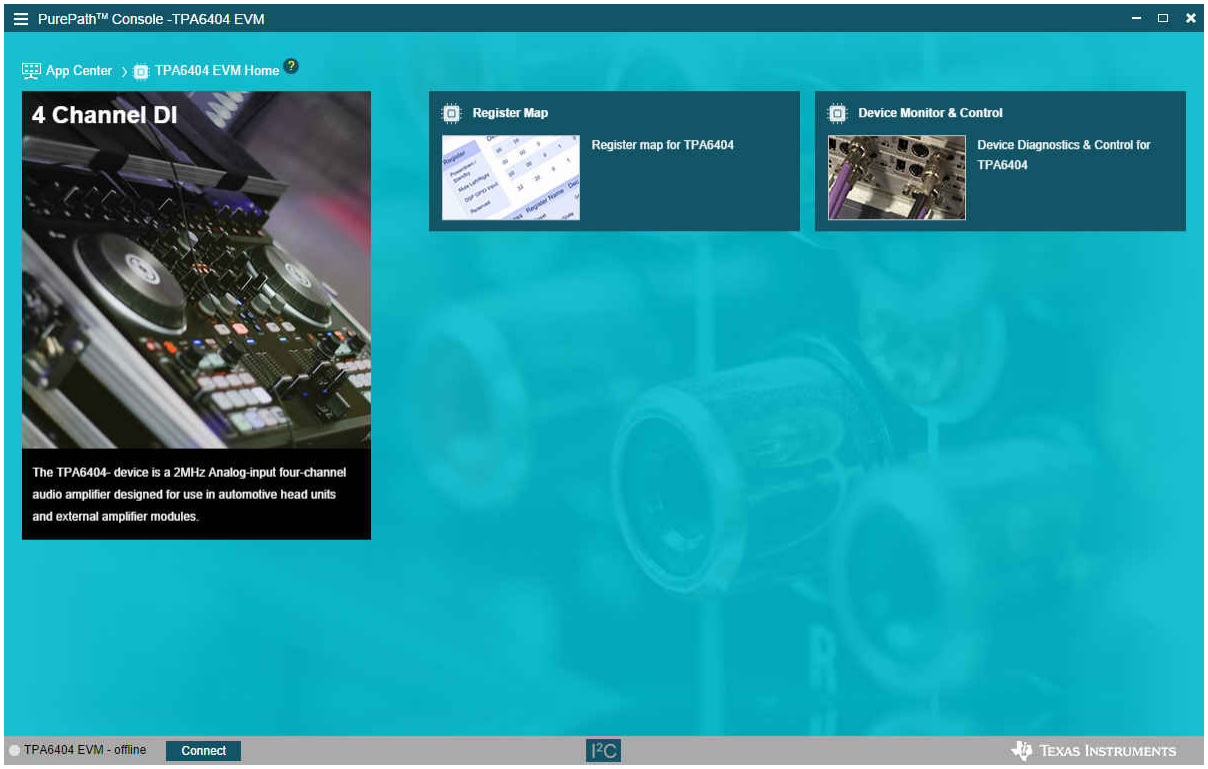

Figure 3-4. TPA6404 EVM Home Window

3.3 PurePath™ Console 3 – TPA6404 EVM Register Map Window

When clicking on the *Register Map Box* on the *Home Window*, the *Register Map Window* is displayed. The *Register Map* indicates the current setting of all the registers in the TPA6404 device.

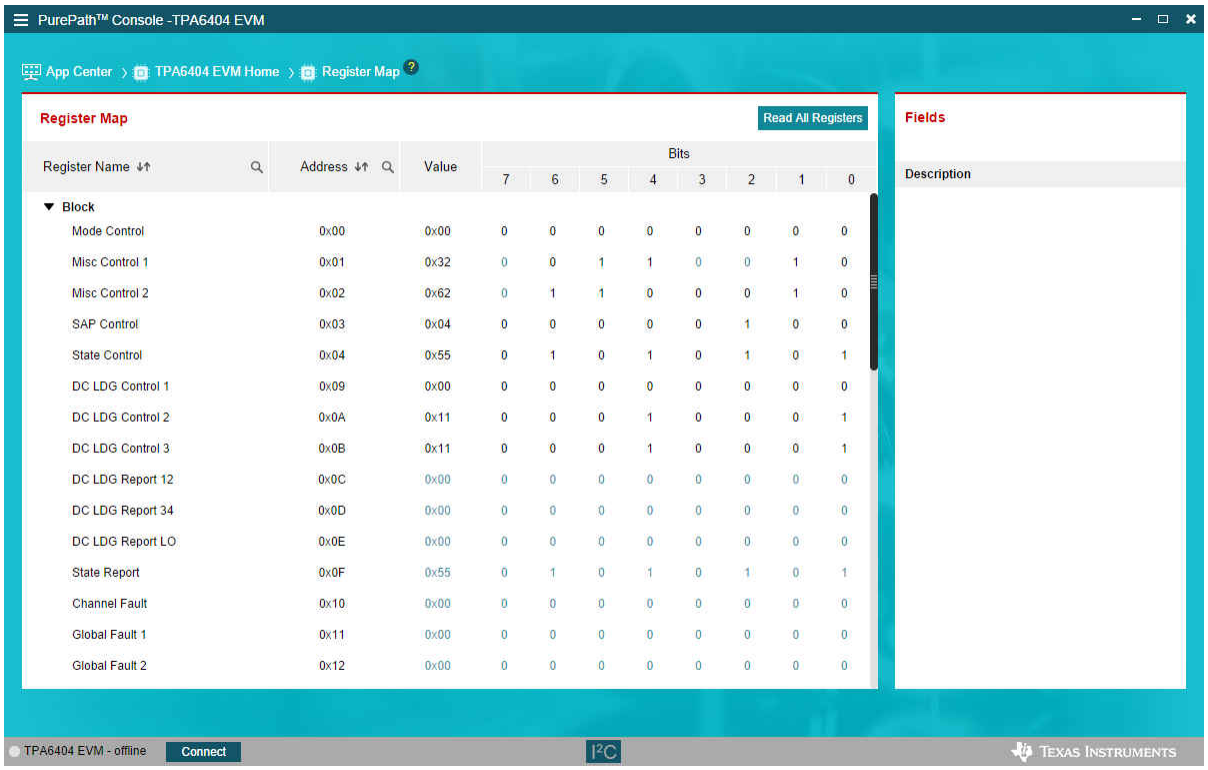

Figure 3-5. TPA6404 EVM Register Map Window

3.4 PurePath™ Console 3 – TPA6404 EVM Monitor & Control Window

When clicking on *Device Monitor & Control* box in the *Home Window*, the *Device Monitor & Control* window is displayed. The *Register Map* indicates the current setting of all the registers in TPA6404.

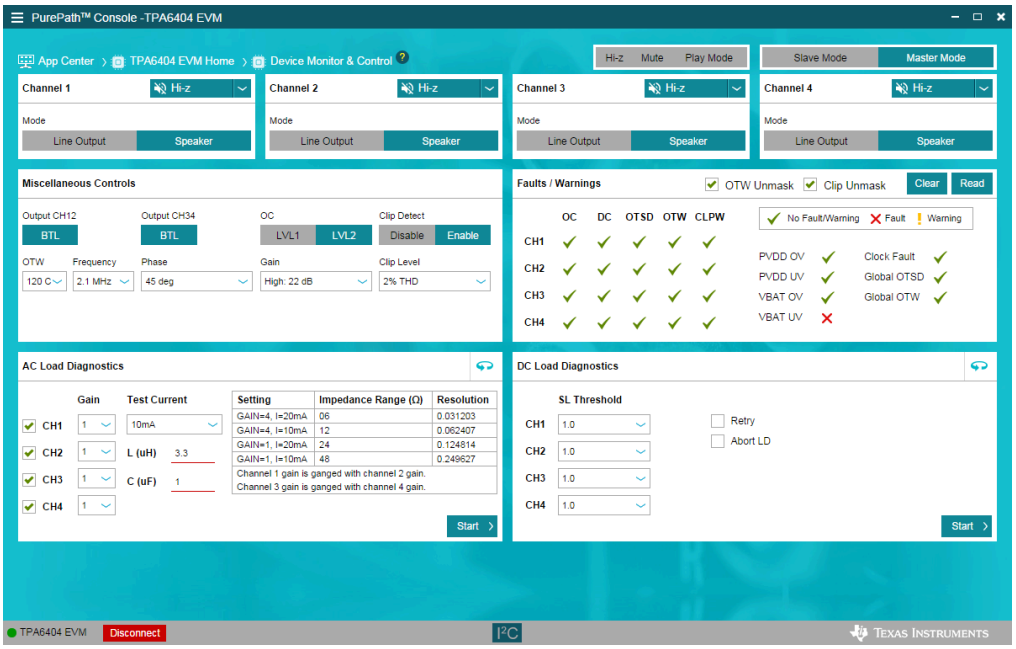

Figure 3-6. TPA6404 EVM Device Monitor & Control Window

4 TPA6404 EVM Start Up

This section describes the TPA6404 start up procedure. Have all the equipment and accessories listed on the first page of this document available.

4.1 TPA6404 EVM Setup

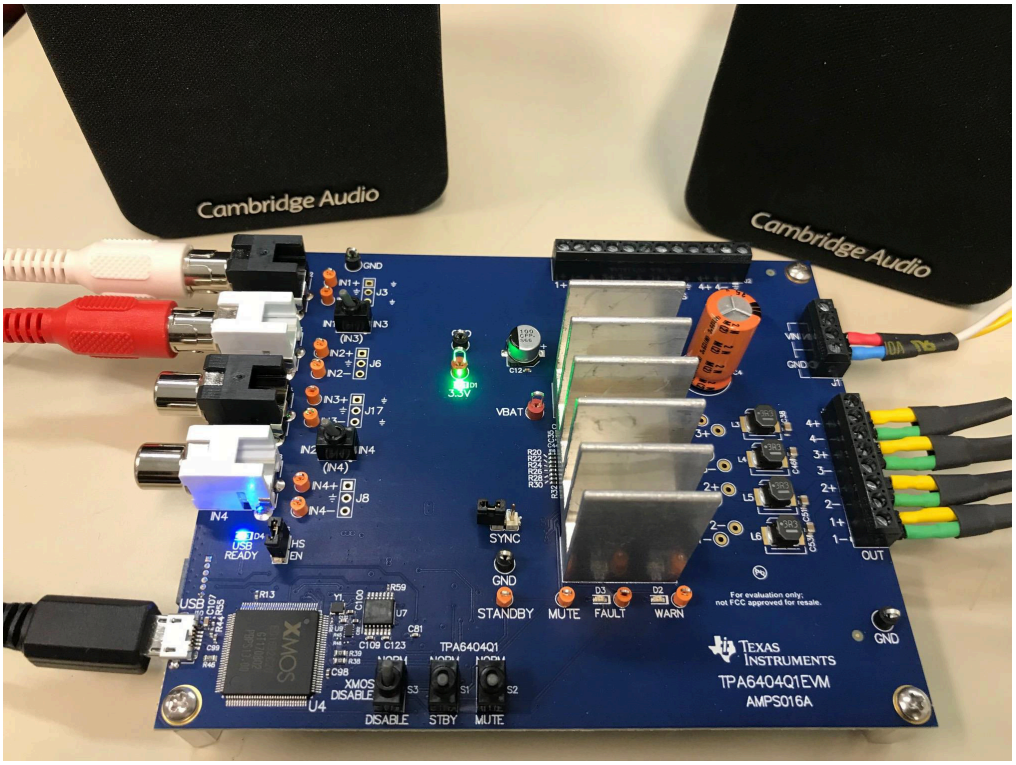

Figure 4-1. TPA6404 EVM Connections

Hardware and software connections:

- Desktop or laptop PC running Windows 7. Open PPC3 GUI.
- Connect 14.4-VDC PSU to the TPA6404 EVM
- Connect speakers or resistive loads to the TPA6404 EVM
- Connect USB micro cable from the PC to the EVM
- Set the switches (STANDBY, MUTE) to down positions
- Turn on the PSU
- Connect the audio source – this can be a 3-mm stereo connector connected from the PC to the EVM as shown in Figure 4-1.
- At this point, 3.3V LED, and USB-LOCK LED are on.
- On the PPC3 window, launch the TPA6404 EVM application
- Click *Connect* at the bottom left corner of the window
- Click *Device Monitor & Control*
- Click on *Play* at the top left corner of the window
- On the PC make sure the volume level is set as desired. The maximum level is quite loud.
- On the EVM, first switch up the STANDBY switch and then the MUTE switch
- The audio can now be streamed to the speakers

4.2 TPA6404 Settings on Device Monitor & Control Window

Most of the register settings are done on the *Device Monitor & Control* window. The TPA6404 *Register Map* window is for reference.

Click the *CONNECT* button on the bottom left corner of the TPA6404 EVM application window, see Figure 3-5. The LED next to the TPA6404 EVM changes from gray to green and the *CONNECT* button changes to a *DISCONNECT* button.

Click on the TPA6404 *Device Monitor & Control* box, the Device Monitor & Control window displays.

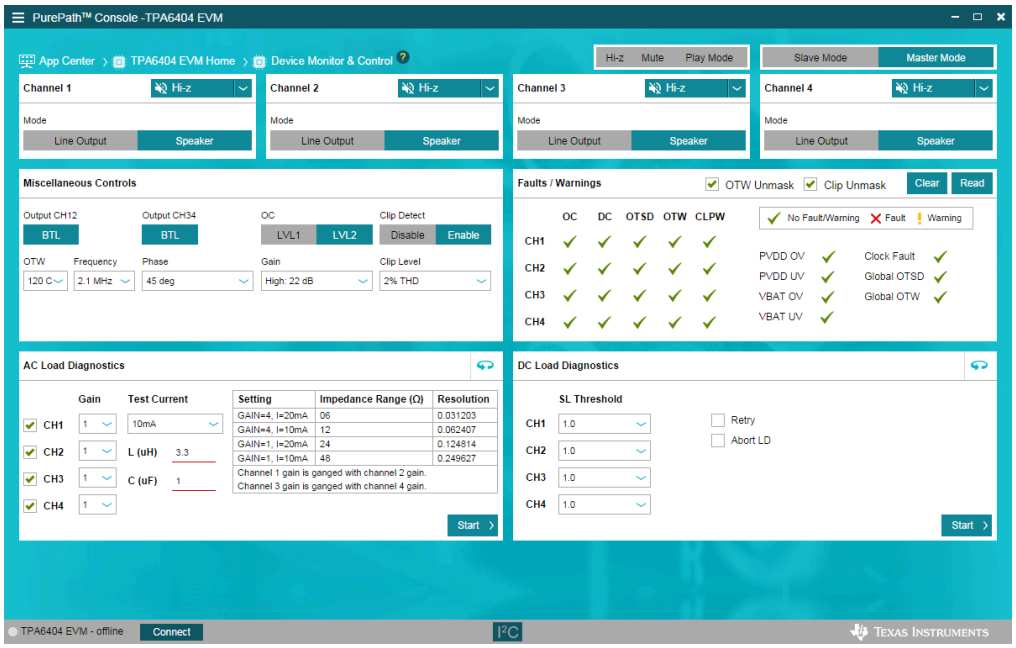

Figure 4-2. Device Monitor & Control Window

This window has 7 major sections: the global control section, channel control section, miscellaneous control section, faults and warnings section, AC load diagnostics section, and DC load diagnostics section.

4.2.1 Global Control Section

The *Hi-z*, *Mute* and *Unmute* buttons with the gray background control all 4 channels at the same time. When Hi-z is selected, all 4 channels are put in Hi-z. The display for each channel in the channel control section reflects these button selections.

Figure 4-3. Global Control Section

The *Reset* button is a software reset. This puts the device back in default settings.

4.2.2 Channel Control Section

Each channel has the same setting selections: *Hi-z*, *Mute*, and *Play* mode.

Figure 4-4. Channel Control Section

4.2.3 Miscellaneous Control Section

There are miscellaneous settings that are available on the GUI for easy access (see Figure 4-5).

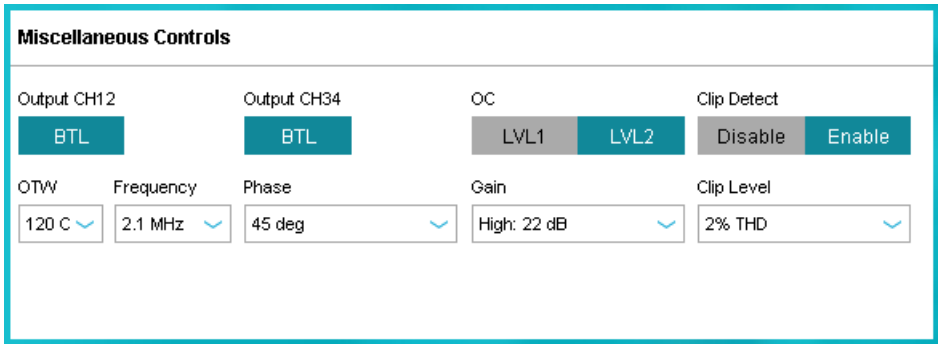

Figure 4-5. Miscellaneous Control Section

The overcurrent has two levels. The lower level is 1, the default is level 2. When running 6- or 8-Ω speakers, the OC level can be set to 1.

Overtemperature warning can be programmable, use the pull-down menu to choose the OTW temperature. The default setting is 120°C.

The output switching frequency (FSW) or Pulse Width Modulation (PWM) frequency is set at 2.1 MHz. The pull-down menu on the *PWM FRQ* box is used to choose a lower FSW.

The PWM output (at the pin) offset phase for each channel is set at 45 degrees. This helps lower the ripple current on the power supply as not all the channels switch at the same time. To choose a different phase offset, use the pull-down menu on the *Phase* box. TI recommends using the default value. If other settings are used, thorough testing is strongly recommended.

There are four gain settings in the TPA6404: low, medium, high and max. The default setting is standard gain for driving speakers at 14.4 VDC. The gain setting is selectable via the drop-down menu in the *Gain* box.

4.2.4 Faults / Warnings Section

The top right buttons on the *Faults / Warnings* box serve as controlling and monitoring faults.

Clip enable route the clip detection bit to the warning pin. This is displayed as a yellow LED on the EVM.

Thermal enable route the overtemperature warning bit to the warning pin. This is displayed as the same yellow LED on the EVM. The **Clear** button clears all the faults and warnings. The **Read** button manually read the faults and warnings.

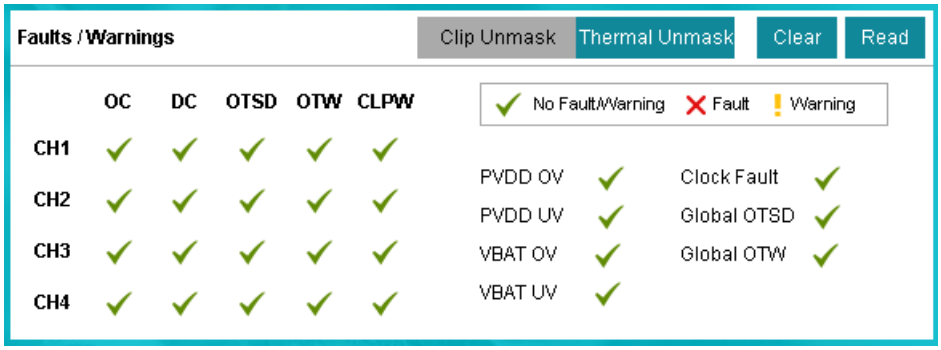

Figure 4-6. Faults / Warnings Section

4.2.5 AC Load Diagnostics Section

The AC load diagnostics report speaker impedance and phase. Diagnostics are performed with one or all four channels.

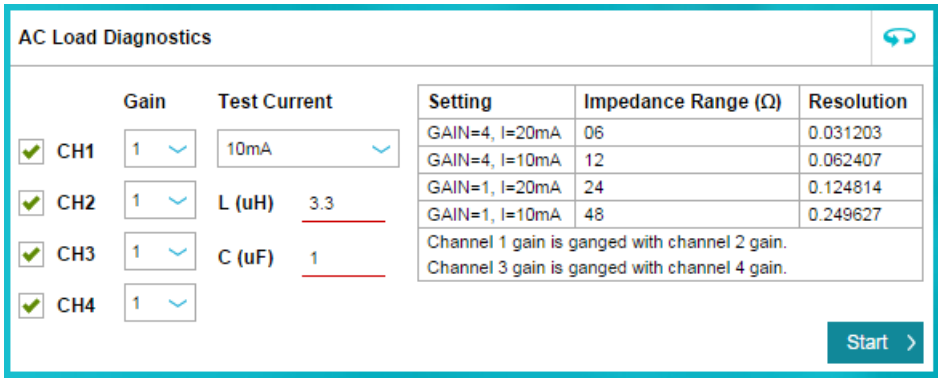

Figure 4-7. AC Load Diagnostics Section

Select the correct output impedance and click the *Start* > button. Follow the pop up instructions to run the load diagnostics.

Click on the icon located on the top right of the AC load diagnostics box to see the results.

4.2.6 DC Load Diagnostics Section

The DC load diagnostics report if a channel is short to power, short to ground, short to load, or open.

Figure 4-8. DC Load Diagnostics Section

Select the impedance of the load from 0.5 to 5 Ω. Click *Start* > and then click the icon on the top right of the box to view results.

If a channel is selected as a line-out, click on “LO ENA LD” to enable line-out load diagnostics. Use the *Retry* box when DC load diagnostics are run more than one time. Exit DC load diagnostics by clicking the *Abort LD* box.

4.3 TPA6404 Settings on Register Map Window

Select a particular register then double click on any bit, the bit will change state. This state is executed at the end of the click.

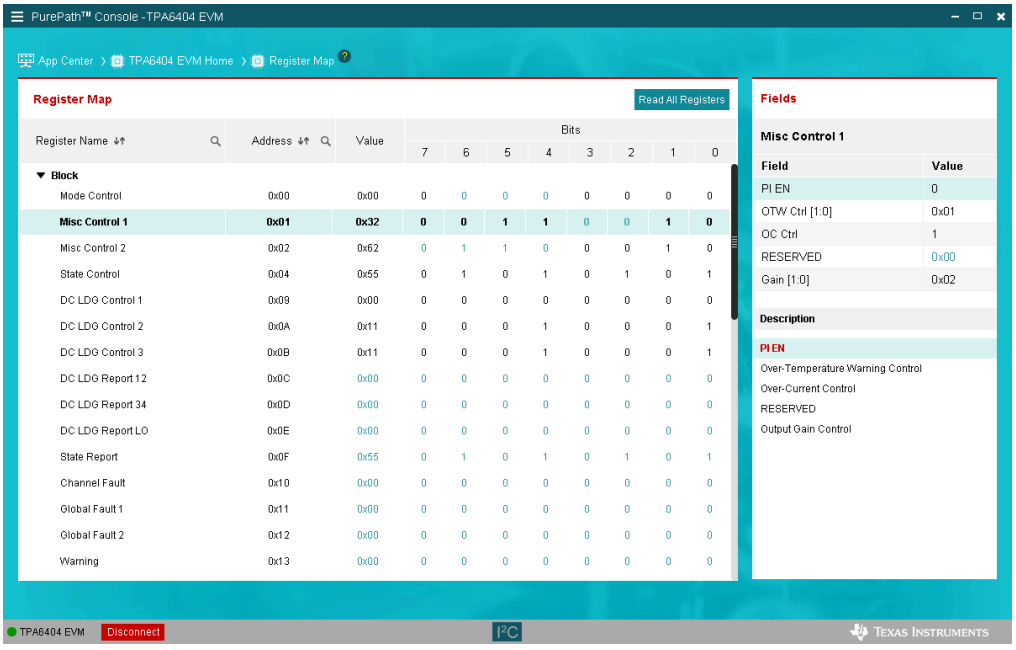

Figure 4-9. Register Map Window

4.4 I2C Window

The PPC3 has an I2C monitor and also configuration program options (see Figure 4-10).

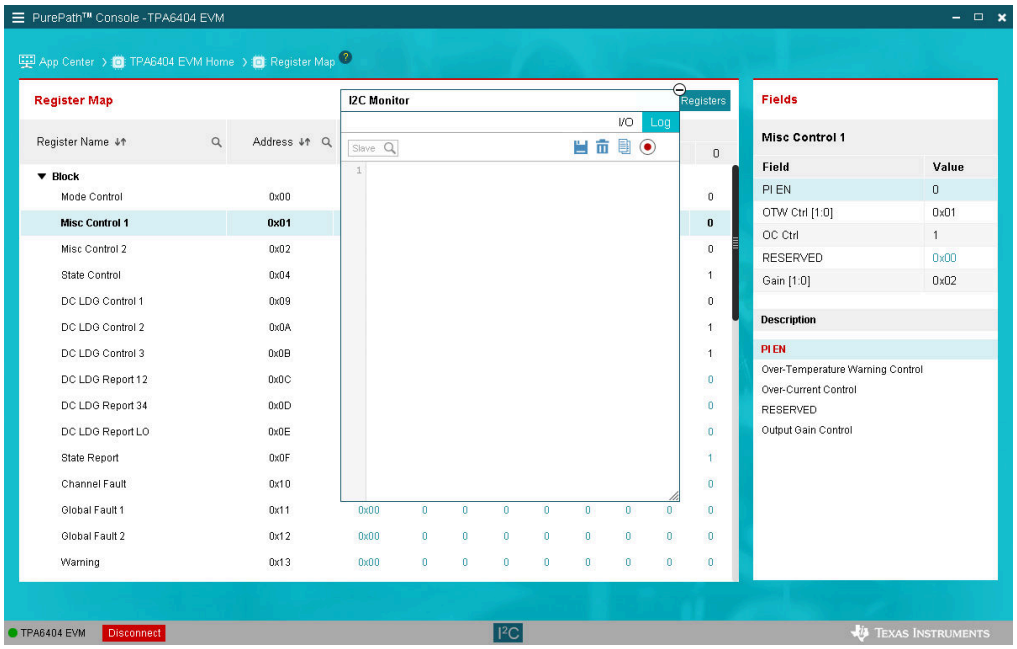

Figure 4-10. I2C Window – I2C Logging

When this window is first open, the round button is green. To record I2C commands, click on this button and it will turn red. The recording can be saved for later use by clicking the save icon.

The I2C commands can also be copied to the clip board by clicking the  icon next to trash bin icon.

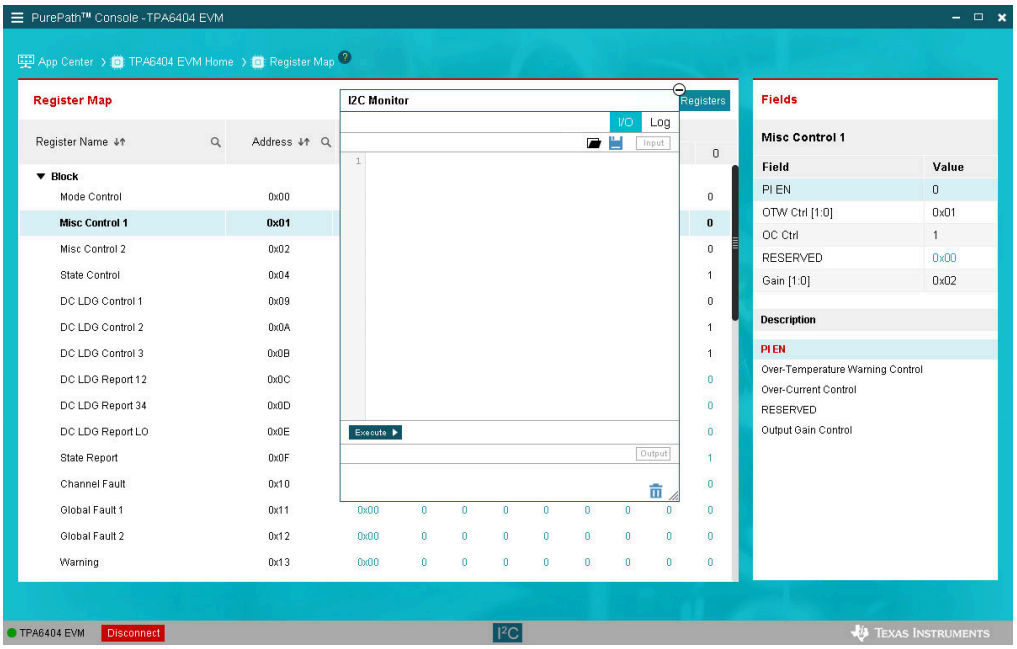

Figure 4-11. I2C Window – Sending I2C Commands

A set of I2C commands can be loaded and executed from this window. On the top right corner, click on the *I/O* button to display the window in Figure 4-11. Write I2C commands here, or open an existing *.cfg file then click

the *Execute* button on the bottom left corner. The I2C commands are sent to the device when the “Execute” button is pressed.

5 Board Layouts, Bill of Materials, and Schematic

5.1 TPA6404 EVM Layouts

Figure 5-1 and Figure 5-2 illustrate the EVM board layouts.

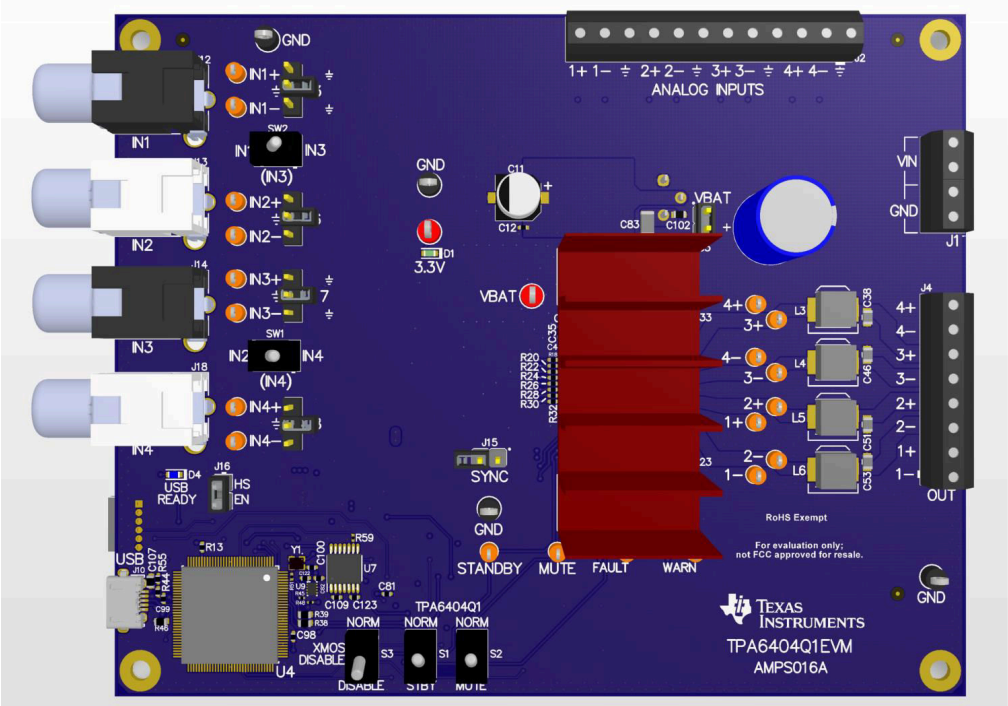

Figure 5-1. TPA6404Q1 EVM Top

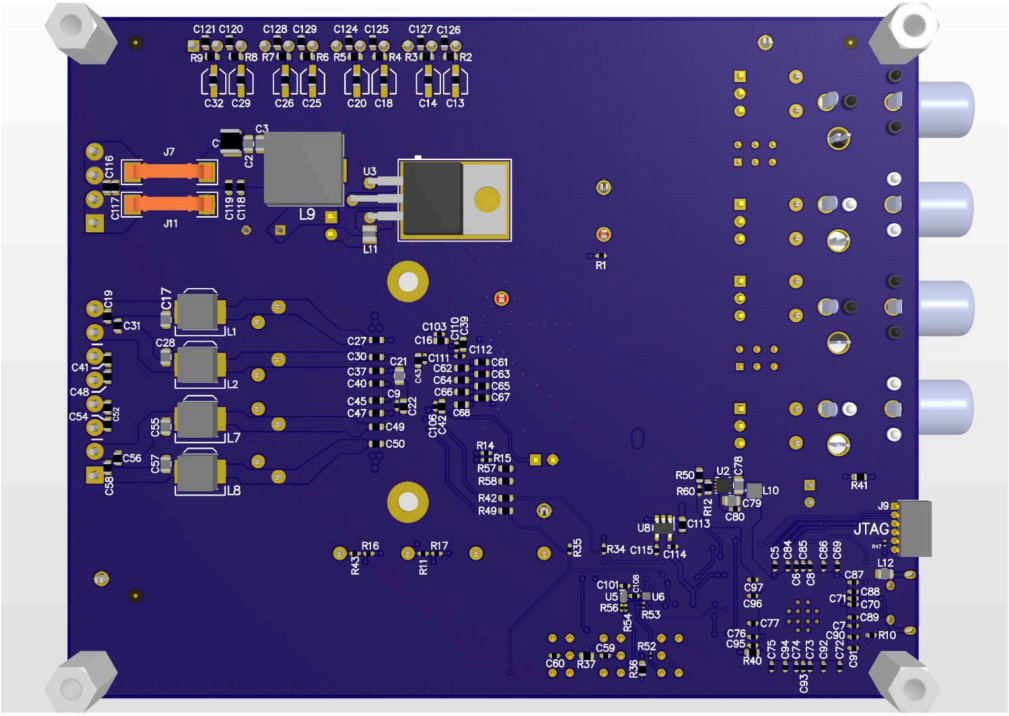

Figure 5-2. TPA6404Q1 EVM Bottom

5.2 TPA6404E1 EVM Schematic

Figure 5-3 and Figure 5-4 illustrate the EVM schematics.

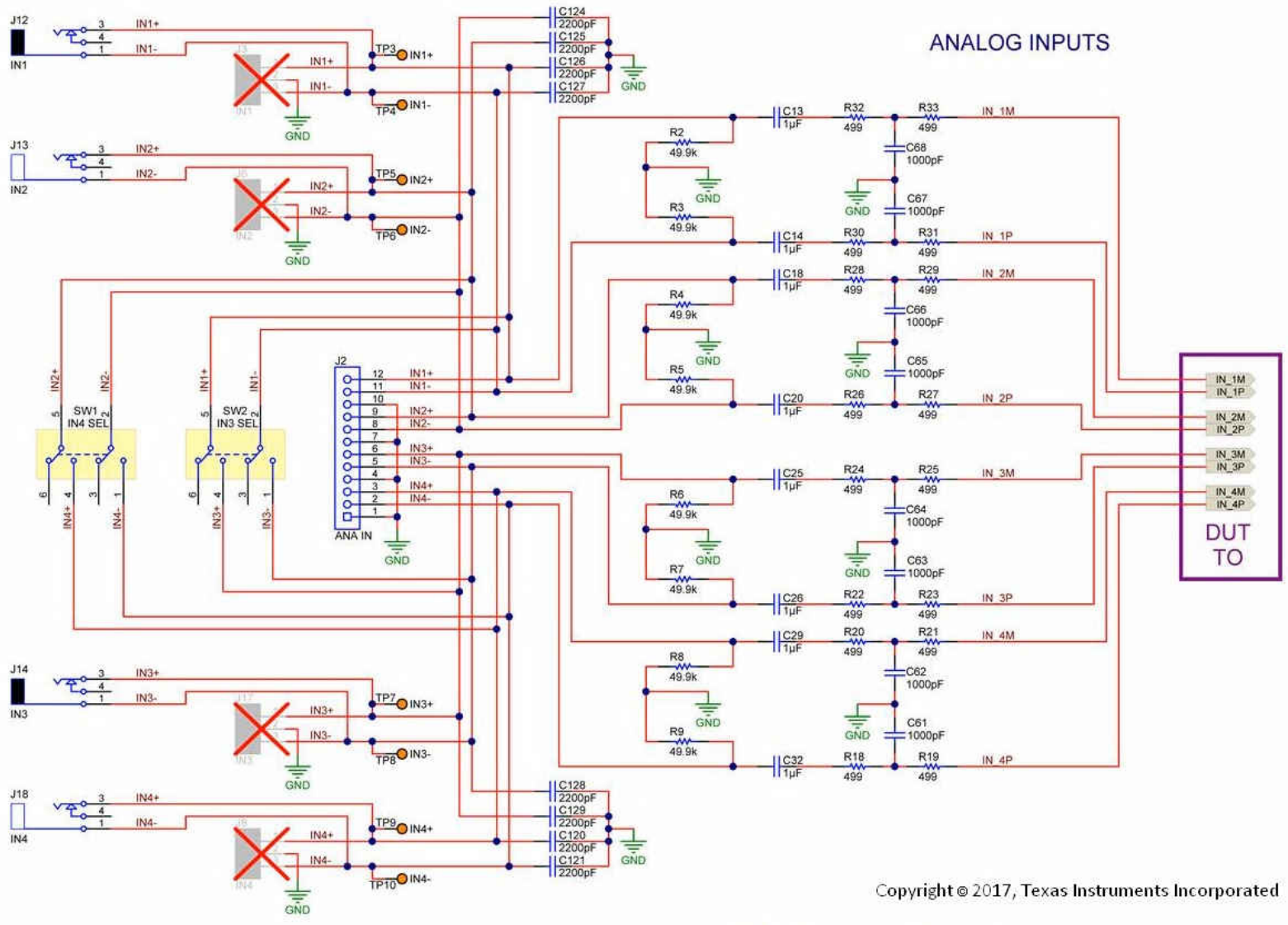

Figure 5-3. TPA6404Q1 EVM Analog Inputs Schematic

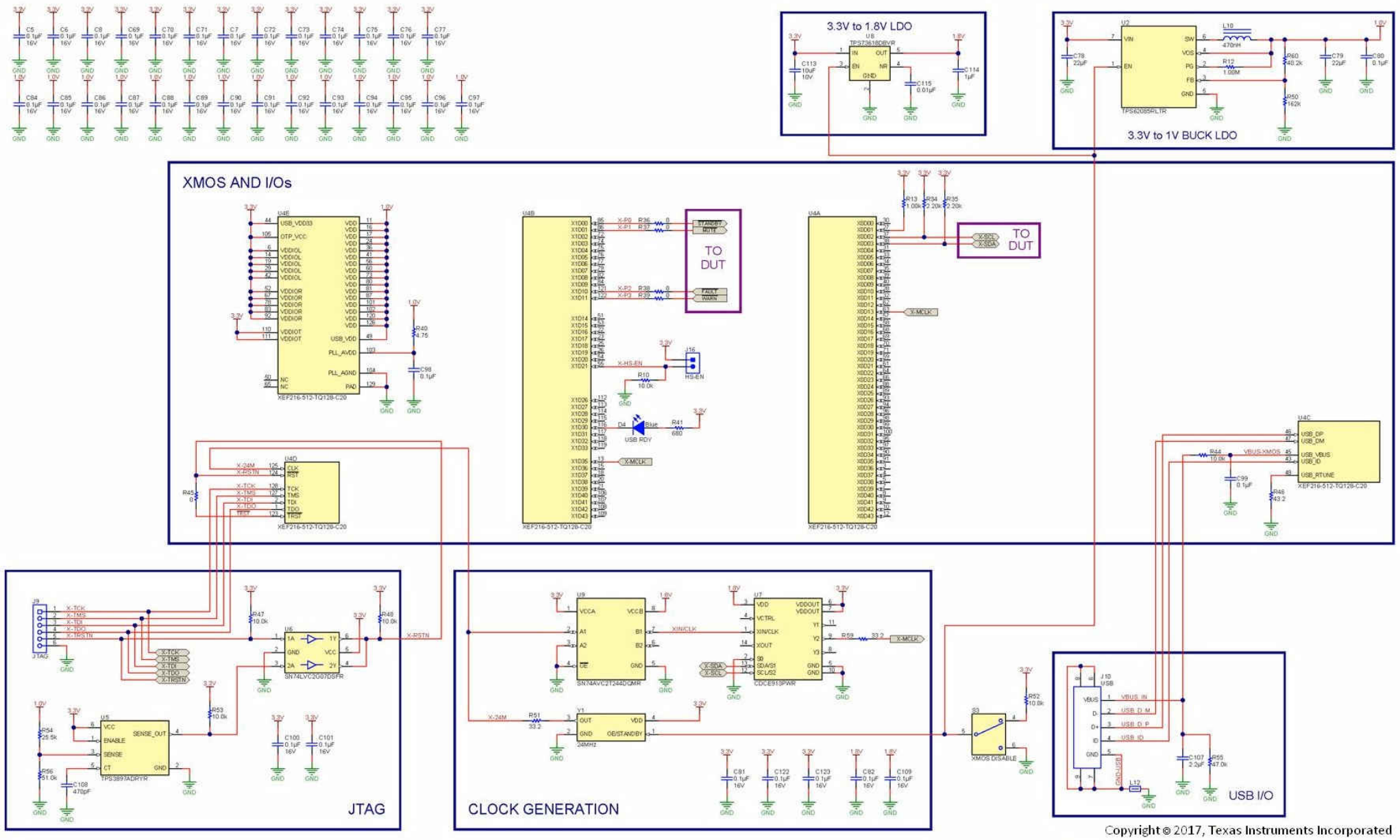

Figure 5-4. TPA6404Q1 EVM XMOS I/O Schematic

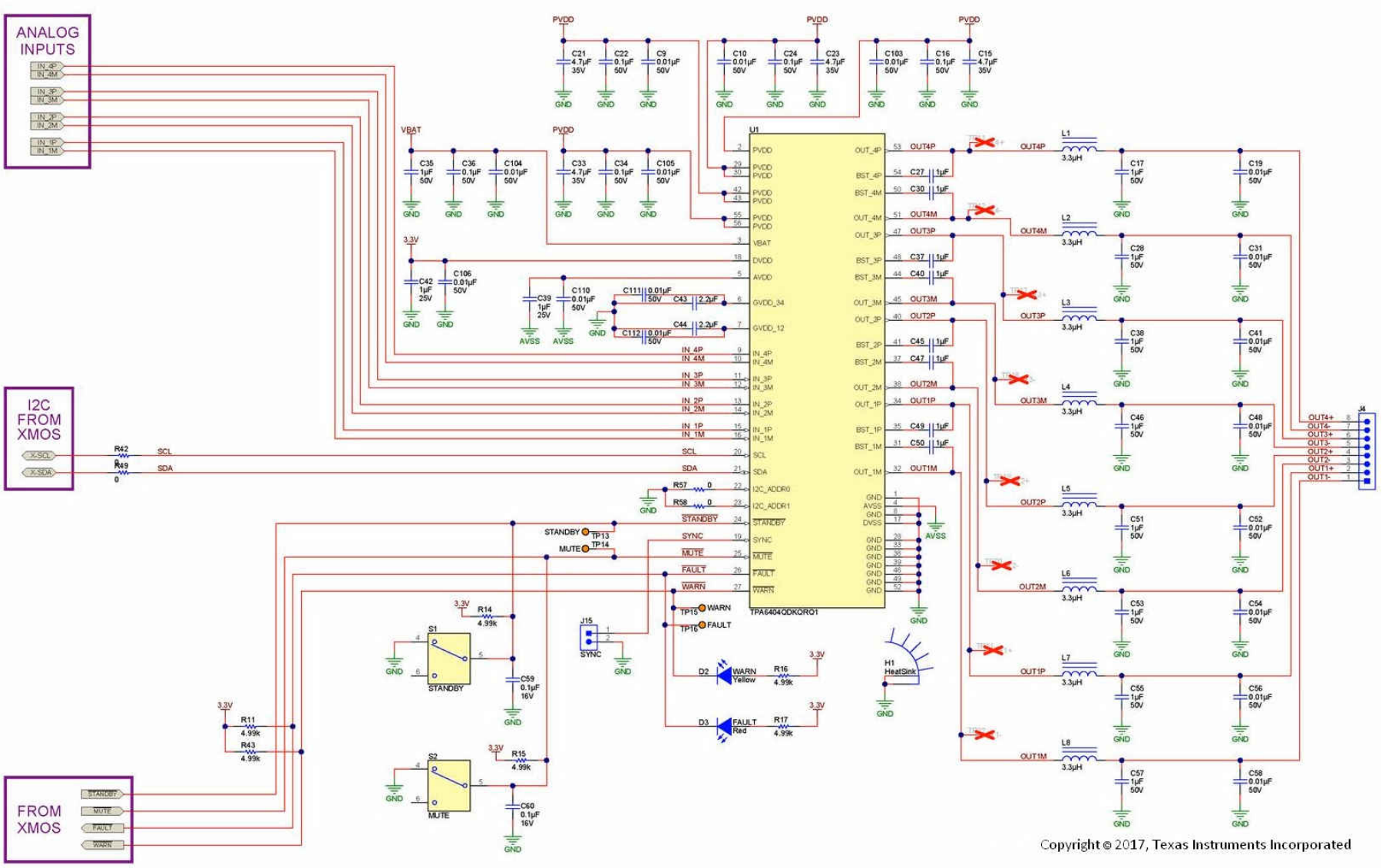

Figure 5-5. TPA6404Q1 Device Schematic

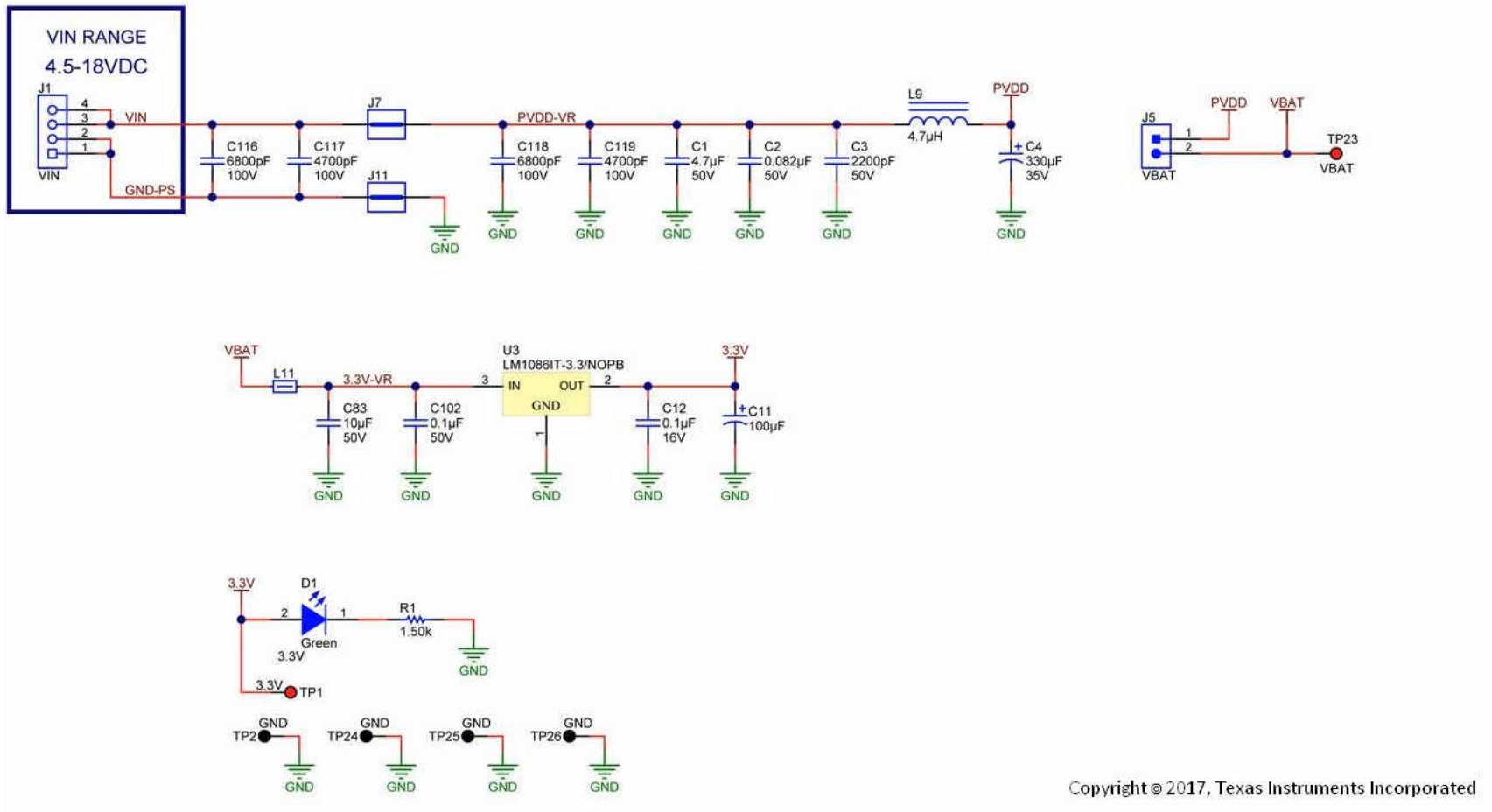

Figure 5-6. TPA6404Q1 EVM Power Supply Input Schematic

6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (October 2017) to Revision A (February 2018)	Page
• Updated Section 2.1 with TPA6404Q1 information and images	2
• Updated *PPC3 Download Window* image	4
• Updated *TPA6404 EVM Connections* image	9
• Updated *Miscellaneous Control Section* section	11
• Updated *TPA6404Q1 EVM Top* and *TPA6404Q1 EVM Bottom* images	16
• Changed Figure 5-3 through Figure 5-6	18

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