DS90UB933-Q1EVM User's Guide

The Texas Instruments DS90UB933-Q1EVM Evaluation Module (EVM) provides an easy way to evaluate the operation and performance of the DS90UB933-Q1 FPD-Link III Serializer.

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1 Overview

Other components required: Power supply (12 V), 50-Ω coaxial cable, and a compatible deserializer board such as DS90UB934. (1) (2)

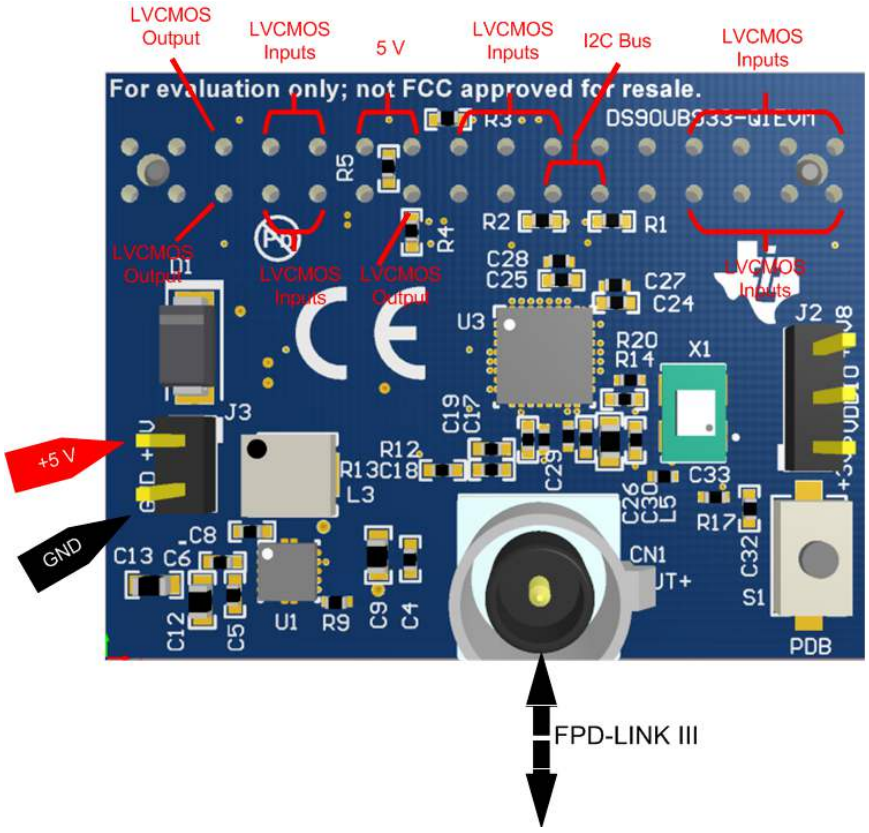

Figure 1. DS90UB933-Q1EVM

Specification for orderable coax cable: (3)
Water Blue, FAKRA Jack to FAKRA Jack Cable, 60-inch length, using RG174 Coax cable. EVM boards have SMB connector mounted as shown in Figure 1.

(1) Coax cable is not provided with the EVM.
(2) Boards are configured to transmit power over coax cable, hence connect power to Deserializer board only.
(3) Not a specific recommendation, for evaluation purpose only.

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2 Operation with Deserializer

Make sure jumper is placed between positions 2 and 3 (VDDIO and +1V8) on J2.

1. Connect the DS90UB933-Q1 and Deserializer board using a coax cable.
2. Ensure Power over Coax is configured with $5V <= V_{PoC} <= 9V$.
3. Connect the 12-V power supply to Deserializer board (recommended current limit is 500 mA) and apply power.
4. Look for the LED D2 to light up on the Deserializer board (if applicable).
   - If the LED is lit and stable, then the Deserializer is LOCKED to the FPD-Link III serial stream… CONGRATULATIONS, you are up and running!
   - If not, continue to the next section.

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3 Troubleshooting the EVM Setup

1. **Check power supply polarity.**

WARNING

Reverse supply polarity can damage the board.

2. Check power over Coax configuration on deserializer board. Make sure correct voltage is applied (5V<=V_{PoC}<=9V). (Refer to Derserializer's user guide for jumper setup)
3. Check to make sure there is sufficient current (500 mA) by checking that the voltage (12 V) is correctly applied to deserializer using DMM.
4. Check to make sure there is a FPD-Link III signal by probing on both C17 AND C19.
5. Monitor the LOCK signal using oscilloscope on DES board. Do not rely on visual inspection of Lock LED present on deserializer board.
6. With no PCLK input applied on SER board, PCLK output frequency on DES board should be 50MHz for the default settings.

Table 1. PCLK Output (on DES) without Applying PCLK Input (on SER)

Mode Selected	PCLK Output Expected
10 bit mode (default mode)	50 MHz
12 bit high frequency mode	37.5 MHz

7. Go back to to double check factory settings.

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4 Board Setup Details

This section describes the connectors and jumpers on the board as well as how to properly connect, set up and use the DS90UB933-Q1EVM in detail.

4.1 Power Connections

1. Connect an external 12 V to the Deserializer board. (Refer to Deserializer's user guide for specific pins)
2. Connect ground to Deserializer board. (Refer to Deserializer's user guide for specific pins)
3. Since boards are configured to transmit power over coax cable (PoC), it is not required to connect external power to Serializer, unless PoC is not used.

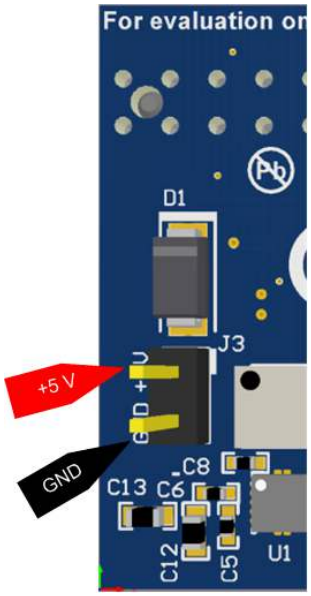

Figure 2. Powering DS90UB933-Q1EVM

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4.2 FPD-Link III Connection

The FPD-Link III serial stream comes out of CN1 on Serializer board as a single ended signal. Connect it to J1 on the Deserializer board. DOUT- on serializer and RIN1- on deserializer are terminated to ground through 47-nF capacitor in series with 50Ω resistance.

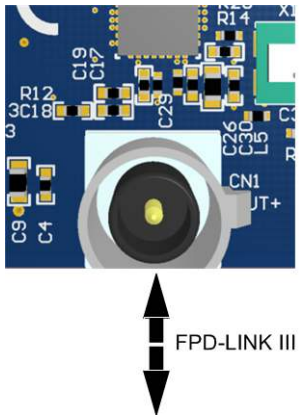

Figure 3. Serial Link Connection Using a Single 50-Ω Coaxial Cable

4.3 LVCMOS Input Connector Description (on DS90UB933-Q1 Board)

J1 – GPO0, GPO1, CLK OUT, CLK IN, DIN[11:0], HSYNC, VSYNC, PCLK IN are the input pins for the LVCMOS interface on Serializer board. Refer to Figure 4 below.

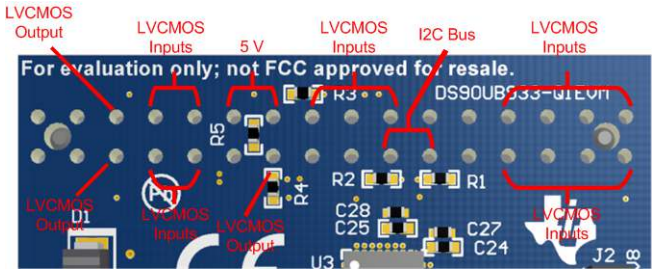

Figure 4. Parallel Input Connector on Serializer Board

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4.4 Factory Set Switch Settings and Jumpers Default Configuration

4.4.1 Serializer Board Default Configuration

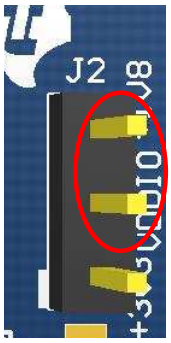

Figure 5. Switch S2: Default Settings on Serializer Board

1. Mode Select Resistor R19 is default set to 4.7kΩ for external oscillator mode. Replace R19 with 100kΩ for PCLK from imager mode.
2. On J2, a 3-pin header is factory placed as shown in. This selects power from U2 for 1.8V VDDIO and **does not have the 3.3V VDDIO option internally.**

5 Using I²C

5.1 Default Addresses

The default 7-bit I²C address of DS90UB933-Q1 is set to 0x58 (101 1000) using suitable resistor divider on ID[x] pin. Change resistor R15 and R16 to change the address of this device, refer device datasheet for more information.

5.2 Analog Launch Pad (ALP)

A USB2ANY is required to use interactive GUI over I²C such as ALP. Download and install ALP from: http://www.ti.com/tool/ALP. This is what ALP should look like when launched while connected to a USB2ANY. The part number on the left may be different, or there may not be one, but the key is that it will say USB2ANY...' under Devices.

In practice the DS90UB933-Q1EVM is programmed by the deserializer such as the DS90UB934 EVM. The deserializers typically have the USB2ANYs I2C programming functionality integrated into the EVM. The DS90UB933-Q1EVM does not contain a USB2ANY in its kit.

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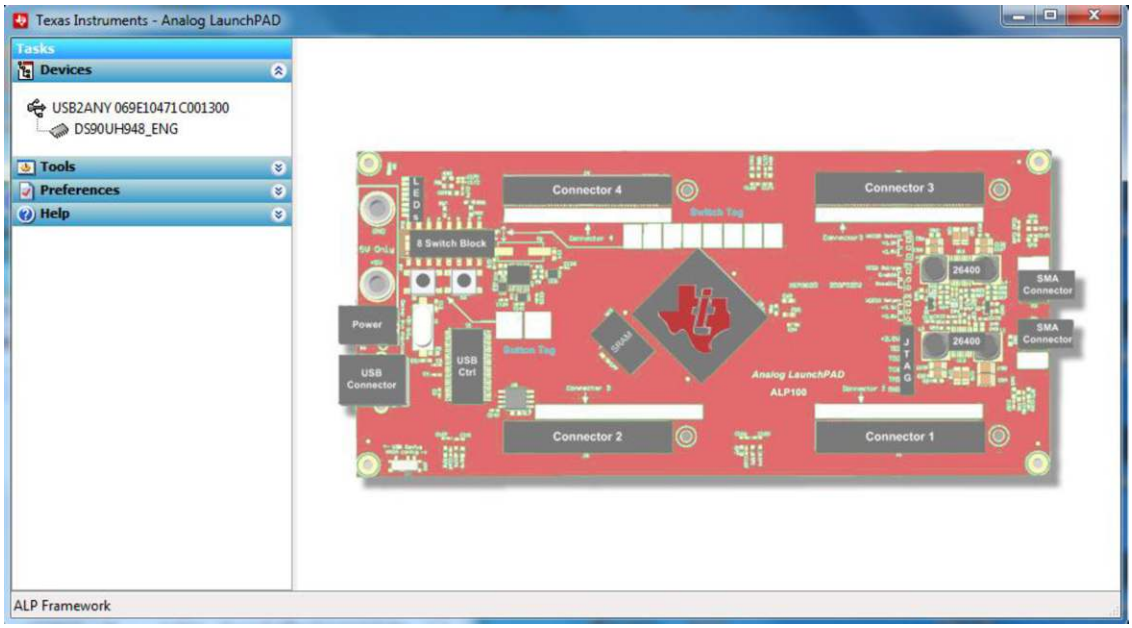
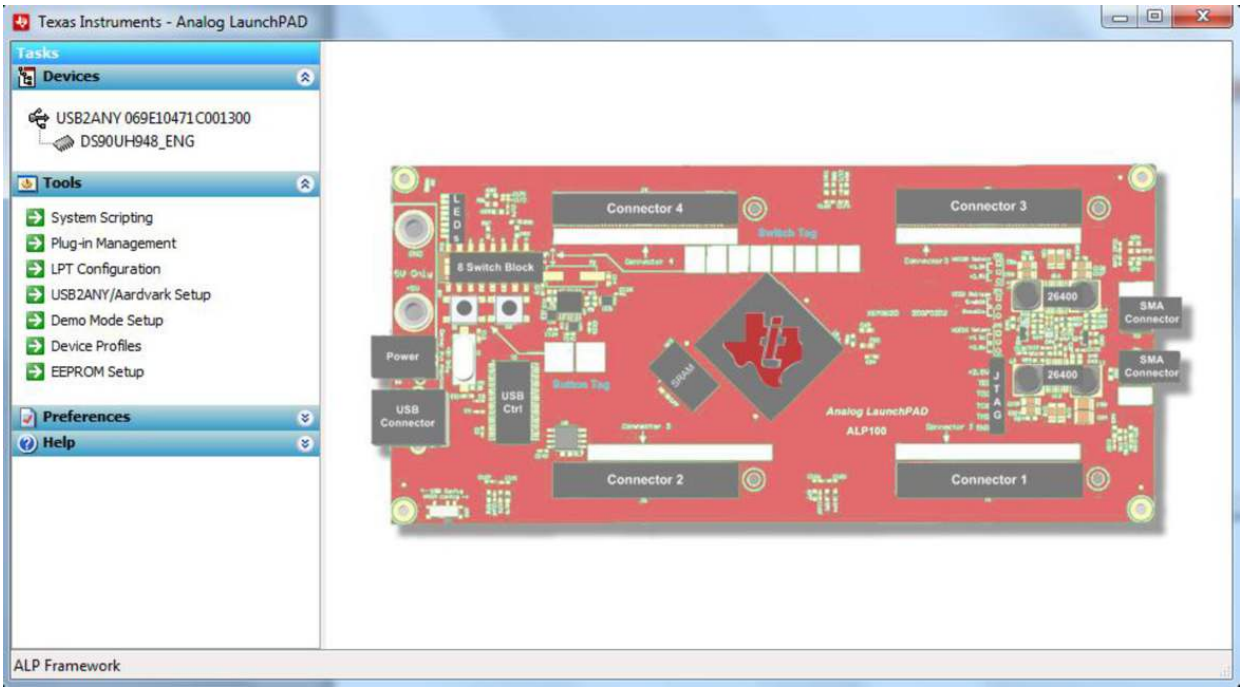


Expand the Tools panel and select USB2ANY/AArdvark Setup.



If there is already a device listed n the menu, then select it and click *Remove*

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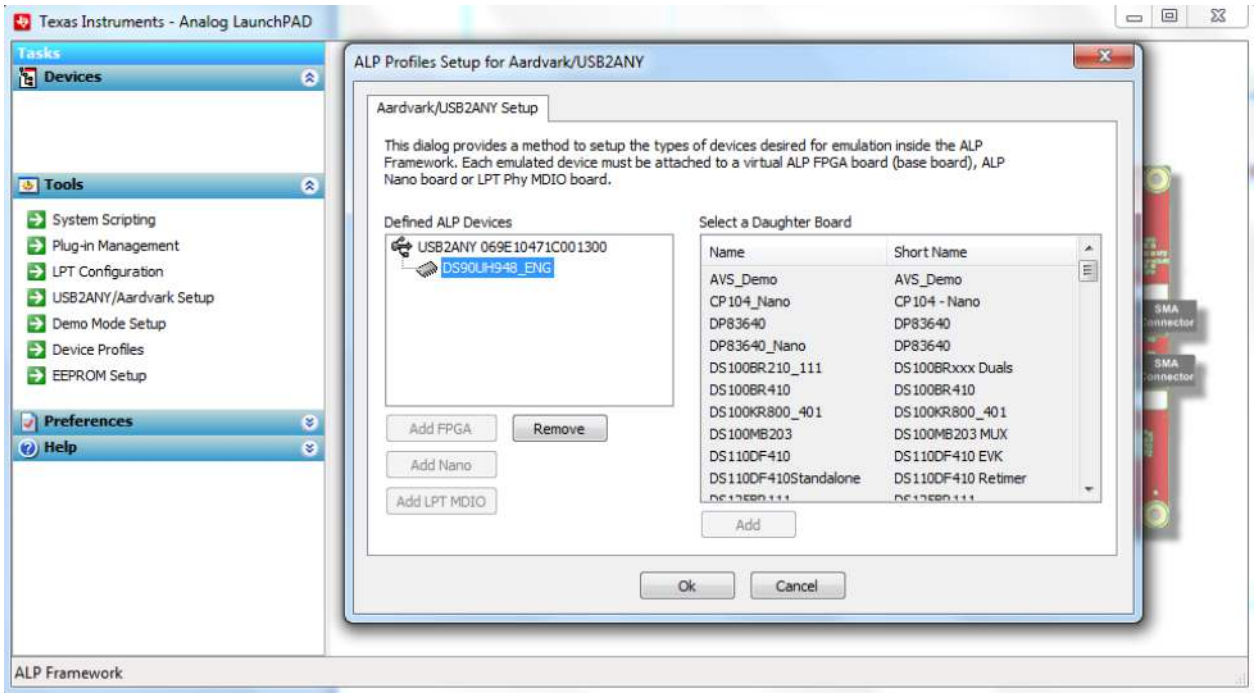
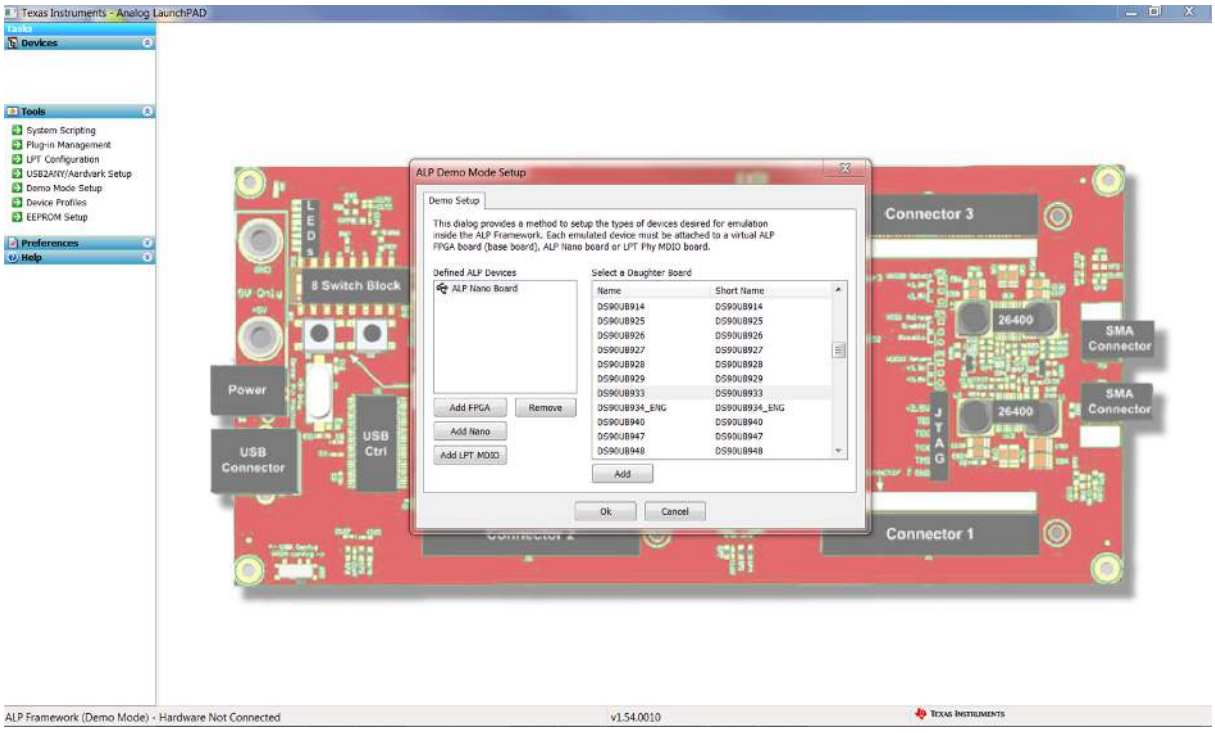


Once it has been removed (or if there wasn't one to begin with), select the EVM name from the list on the right and click *Add*. If you plan on using a deserializer to program the DS90UB933-Q1EVM, select the deserializer name if you have it connected instead.



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6 Schematics

Figure 6. DS90UB933-Q1 Serializer

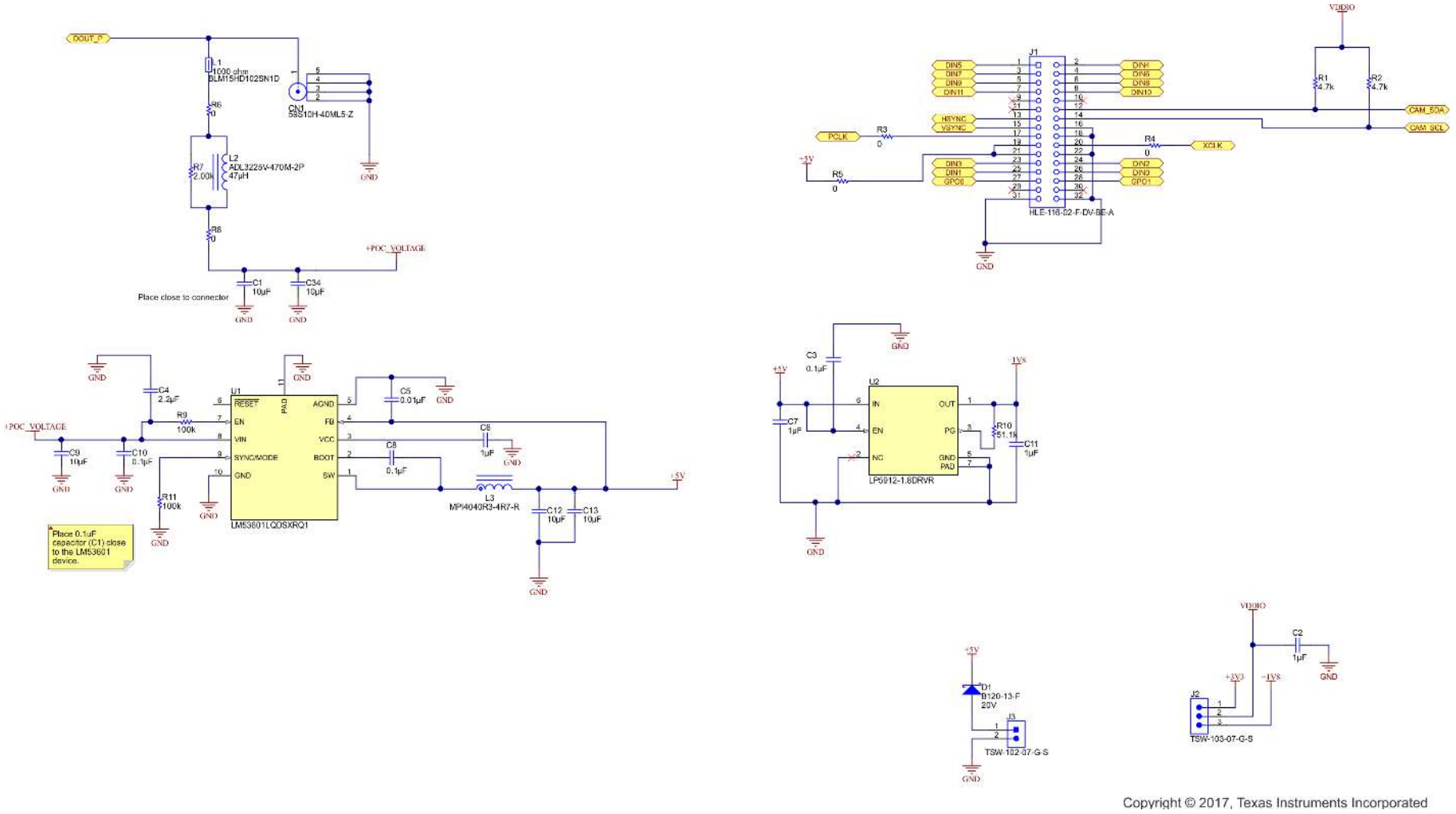

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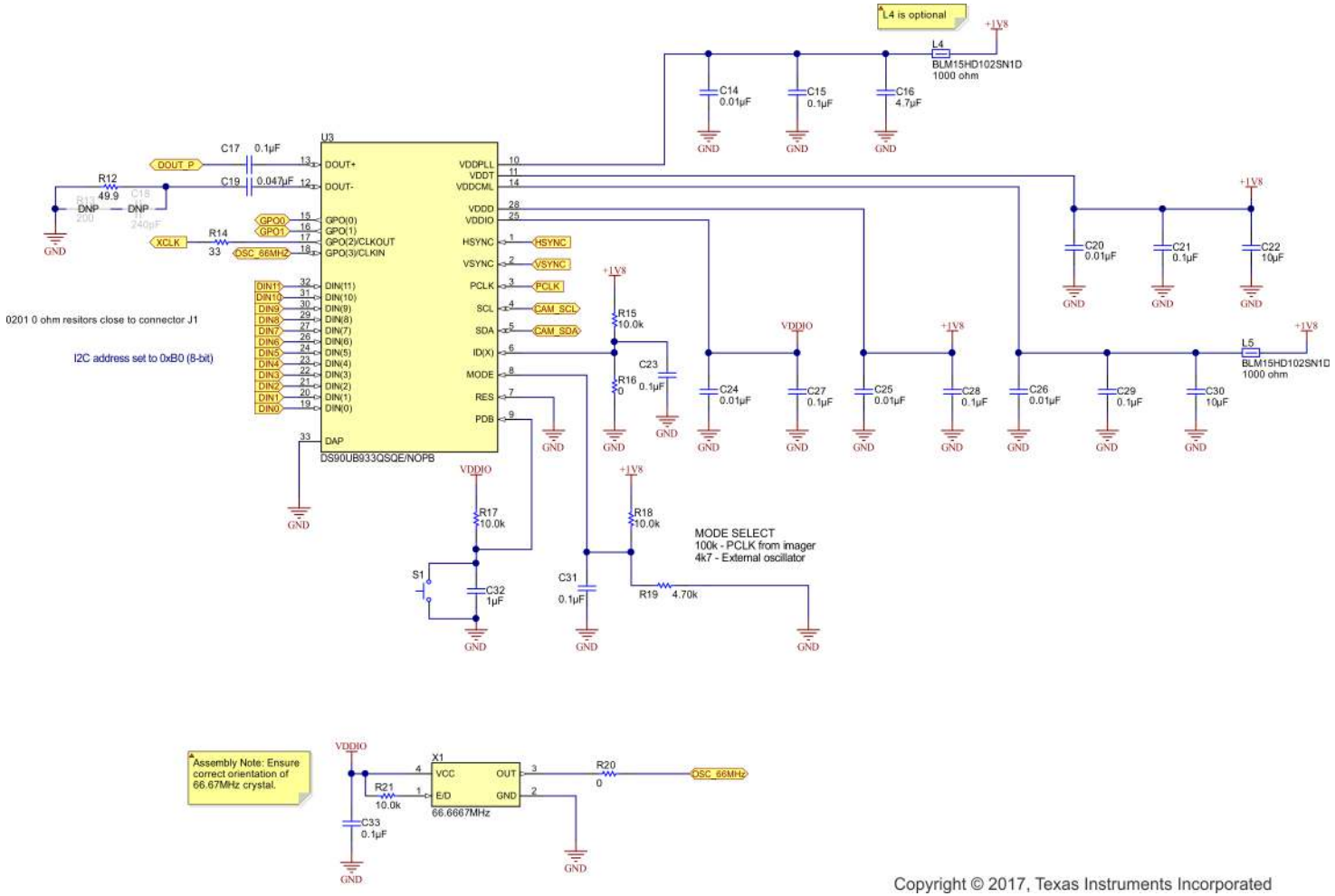
Figure 7. Power to Serializer Board and Header



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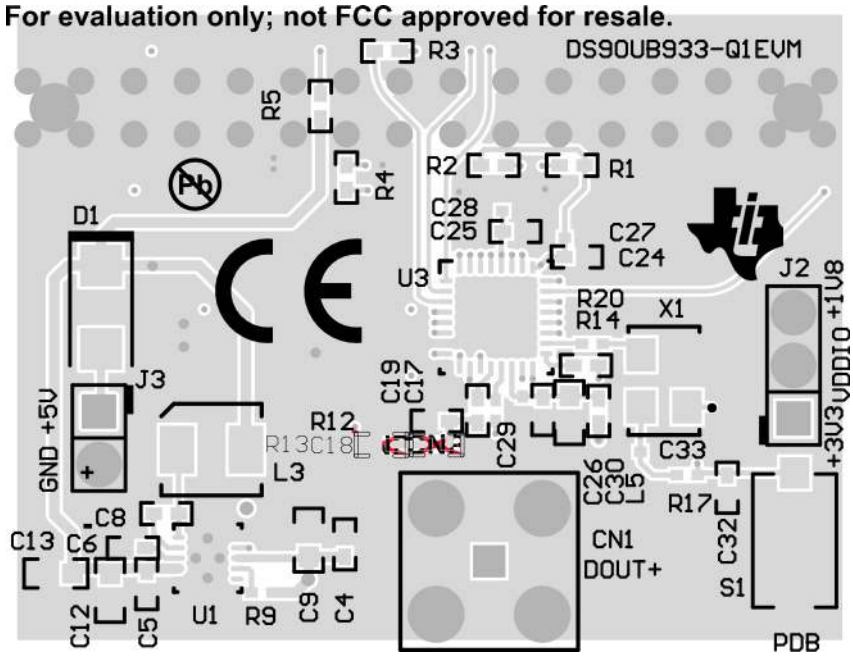
7 PCB Layout

7.1 DS90UB933-Q1EVM Serializer Board Layout

1. DS90UB933-Q1EVM



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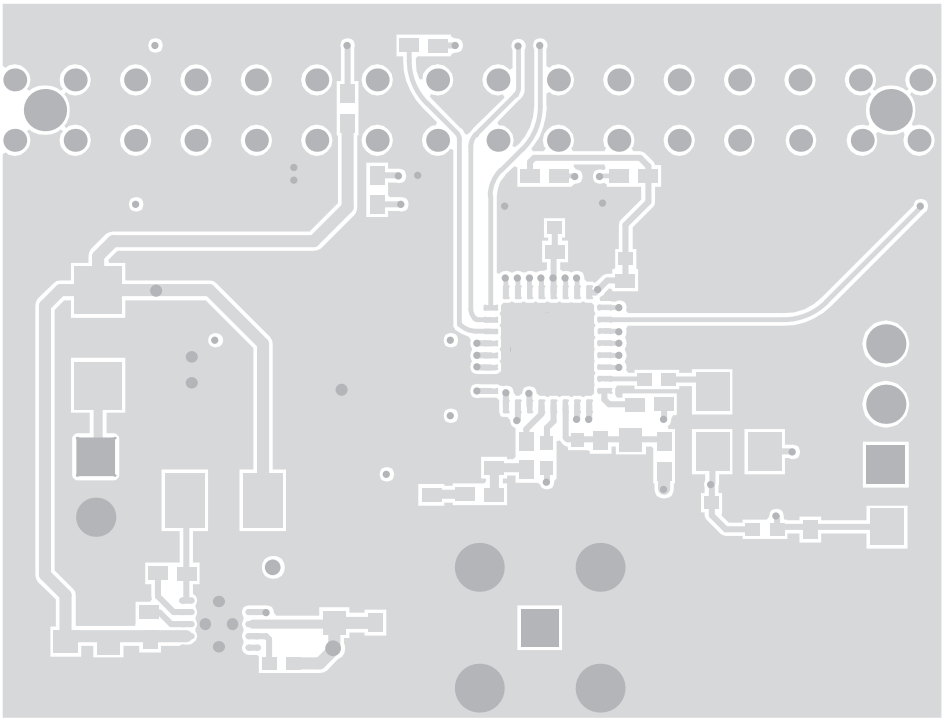
2. TOP Layer



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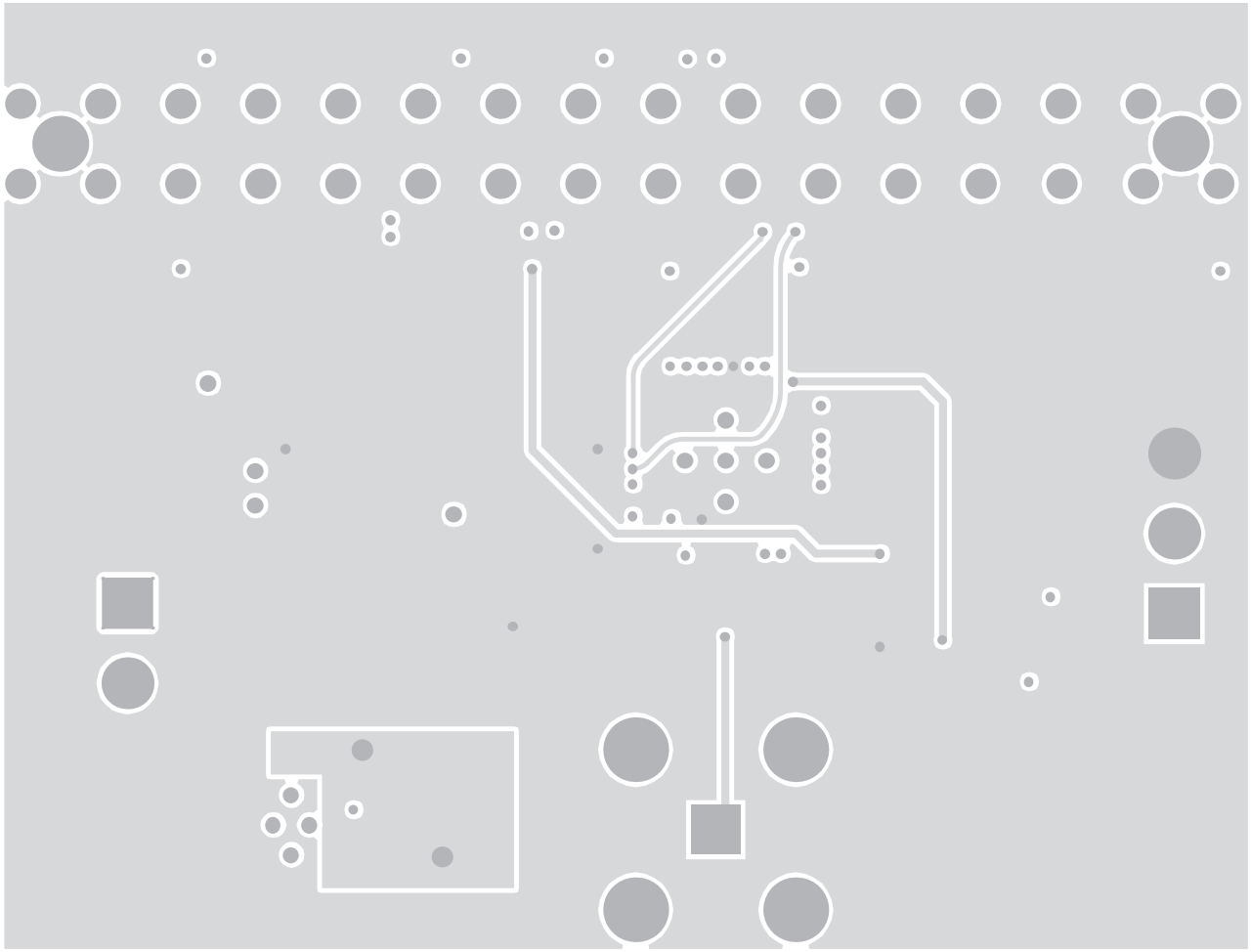
3. Signal 1



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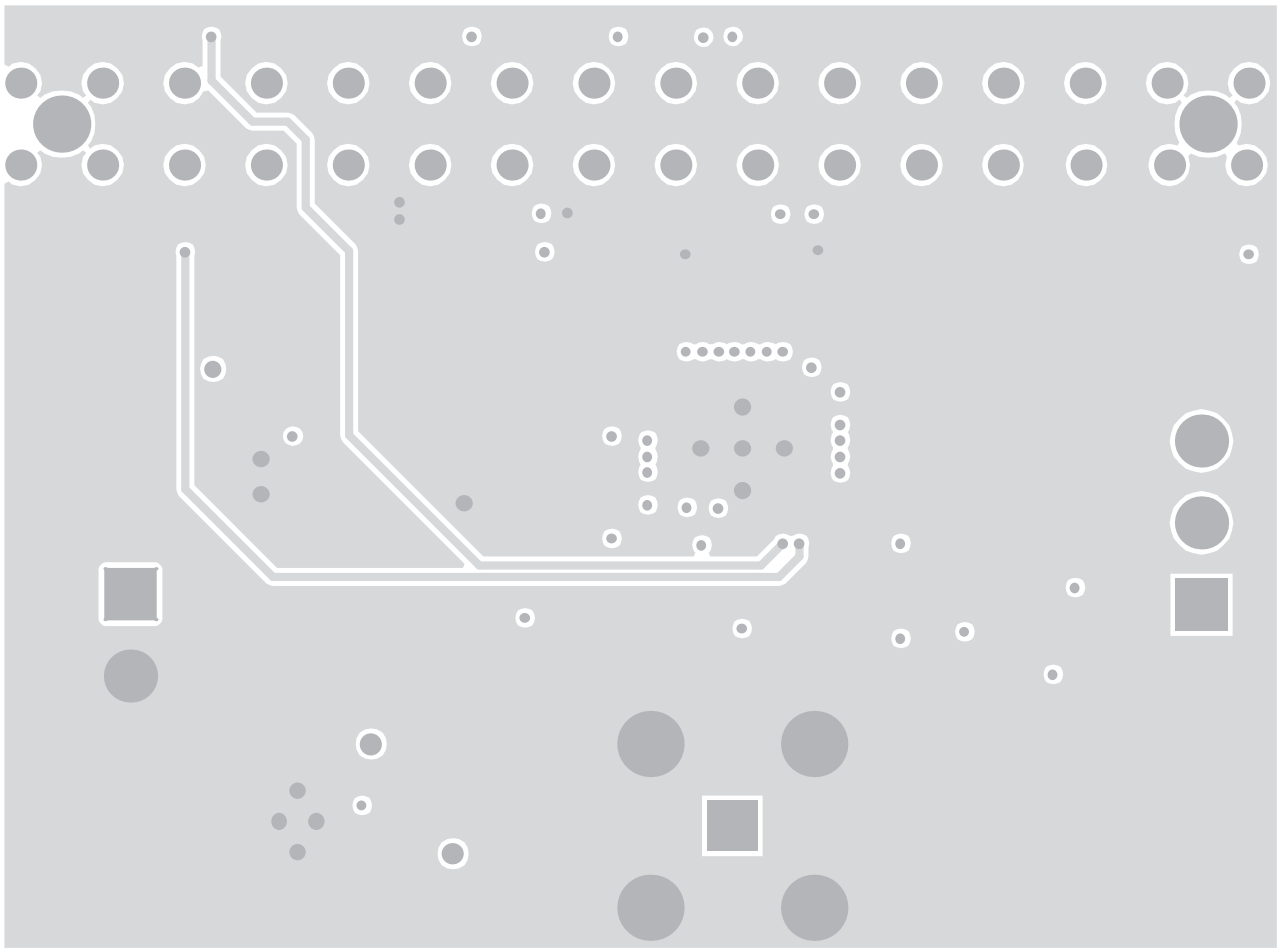
4. Signal 2



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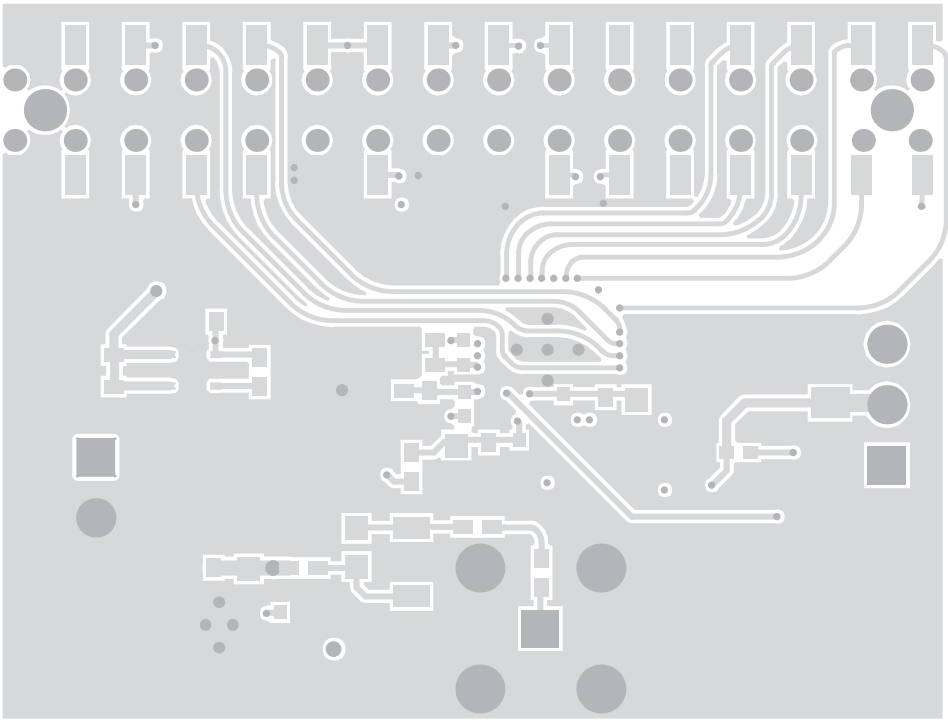
5. Bottom



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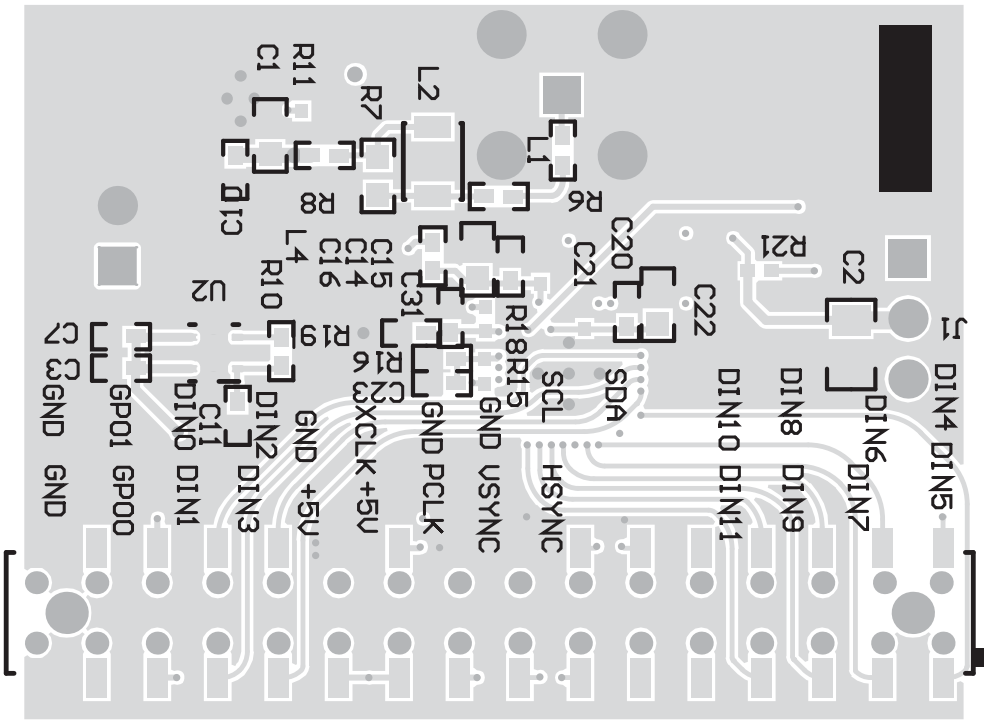
6. Bottom with Overlay (Mirrored)



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8 DS90UB933-Q1EVM Serializer Board Bill of Materials

Table 2. DS90UB933-Q1EVM BOM

QTY	REFERENCE	PART	PCB FOOTPRINT	MFR and PART#
6	C3, C8, C10, C17, C23, C31	0.1µF	0402	TDK C1005X7R1H104K050BB
6	C1, C9, C12, C13, C22, C30	10µF	0603	MuRata GRM188R61E106MA73D
6	C5, C14, C20, C24, C25, C26	0.01µF	0402	MuRata GCM155R71H103KA55D
4	R3, R4, R5, R16	0Ω	0402	Panasonic ERJ-2GE0R00X
3	C6, C11, C32	1 µF	0402	TDK C1005X5R1E105K050BC
3	C27, C28, C33	0.1µF	0805	MuRata GRM155R71C104KA88D
3	C15,C21,C29	0.1uF	0402	MuRata GRM155R71C104KA88D
1	C16	4.7uF	0603	MuRata GRM188R61E475KE11D
1	C4	2.2uF	0402	MuRata GRM155R61E225KE11D
3	L1, L4, L5	1000Ω @ 100MHz	0402	MuRata BLM15HD102SN1D
3	R6, R8, R20	0Ω	0402	Vishay-Dale CRCW04020000Z0ED
3	R15, R17, R21	10kΩ	0402	Vishay-Dale CRCW040210K0FKED
2	R1, R2	4.7kΩ	0402	Vishay-Dale CRCW04024K70JNED
2	R9, R11	100kΩ	0402	Vishay-Dale CRCW0402100KFKED
1	R18	10kΩ	0402	MuRata CRCW040210K0FKED
1	C2	1µF	0805	AVX 08055C105KAT2A
1	C7	1µF	0402	MuRata GRM155R61A105KE15D
1	C19	0.047uF	0402	TDK C1005X7R1H473K050BB
1	CN1	Connector	-	Rosenberger 59S10H-40ML5-Z
1	D1	Schottky		Diodes Inc. B120-13-F
1	J1	Receptacle	2.54mm 16x2	Samtec HLE-116-02-F-DV-BE-A
1	J2	Header	3x1	Samtec TSW-103-07-G-S
1	J3	Header	2x1	Samtec TSW-102-07-G-S
1	L2	47uH	SMD	TDK ADL3225V-470M-2P
1	L3	4.7uH	SMD	Coiltronics MPI4040R3-4R7-R
1	R7	2kΩ	0603	Vishay-Dale CRCW040257R6FKED
1	R10	51.1kΩ	0402	Panasonic ERJ-2RKF5112X
1	R12	49.9Ω	0402	Vishay-Dale CRCW040249R9FKED
1	R14	33Ω	0402	Vishay-Dale CRCW040233R0JNED
1	R19	4.7kΩ	0402	Panasonic ERJ-2RKF4701X
1	S1		S	C and K Components
1	U1	Buck Regulator	WSON (10)	Texas Instruments LM53601LQDSXRQ1
1	U2	LDO	WSON (6)	Texas Instruments LP5912-1.8DRVR
1	U3	SER		Texas Instruments DS90UB933QSQE/NOPB
1	X1	OSC	SMD	Kyocera KC5032K66.6667C1GE00
0	C18	240pF	0402	MuRata GRM1555C1H241JA01D
0	R13	200Ω	0402	Vishay-Dale CRCW0402200RJNED

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Revision History

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

Changes from A Revision (October 2016) to B Revision **Page**

- Revised power supply voltage and current requirement to be compatible with DS90UB934 1
- Revised compatible deserializer board to DS90UB934. 1
- Revised schematic images to include DNP components, R18, C15,C16,C21,C29. 10
- Revised Top layer silkscreen to show CE mark. 11
- Revised BOM to include DNP components, R18,C15,C16,C21,C29. 17
- Changed layout to new format 17

Changes from Original (July 2016) to A Revision **Page**

- Revised schematic images to include DNP components. Also revised dummy termination network on DOUT- to be terminated with 49.9Ω resistor instead of 57.6Ω. 10
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