DS90UB913A-CXEVM & DS90UB914A-CXEVM

User's Guide

Literature Number: SNLU135B
June 2013–Revised April 2016

Introduction

1.1 Overview

The Texas Instruments DS90UB913A-CXEVM & DS90UB914A-CXEVM REV A Evaluation Modules (EVM) provides an easy way to evaluate the operation and performance of the DS90UB913AQ / DS90UB914AQ FPD-Link III Serializer/Deserializer.

(A) The DS90UB913A-CXEVM REV A contains the DS90UB913AQ Evaluation board.

(B) The DS90UB914A-CXEVM REV A contains the DS90UB914AQ Evaluation board

Other components required: Power supply (5 V) and 50-Ω coaxial cable. (1) (2)

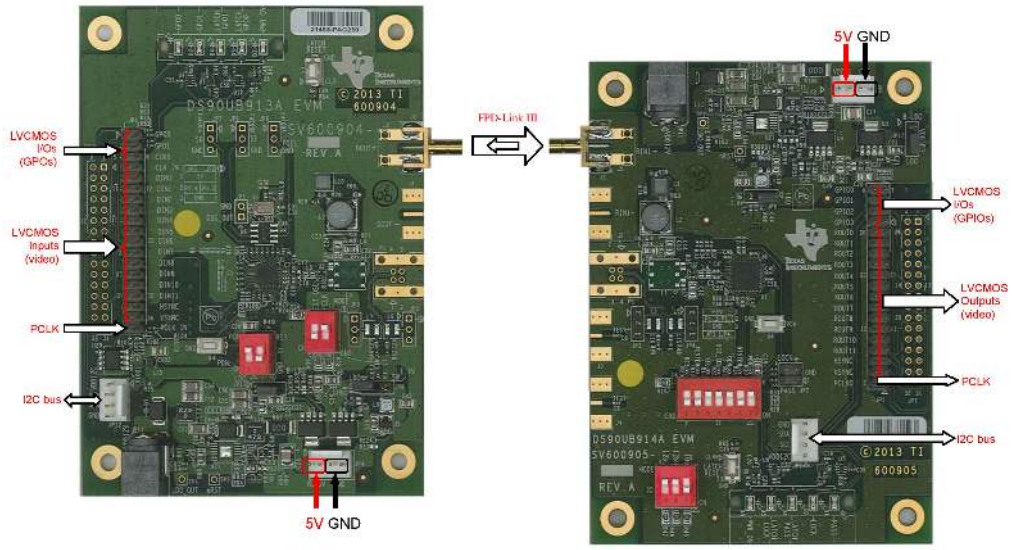


Figure 1-1. DS90UB913A-CXEVM & DS90UB914A-CXEVM pair

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.

(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.

1.2 Quick Setup of EVM

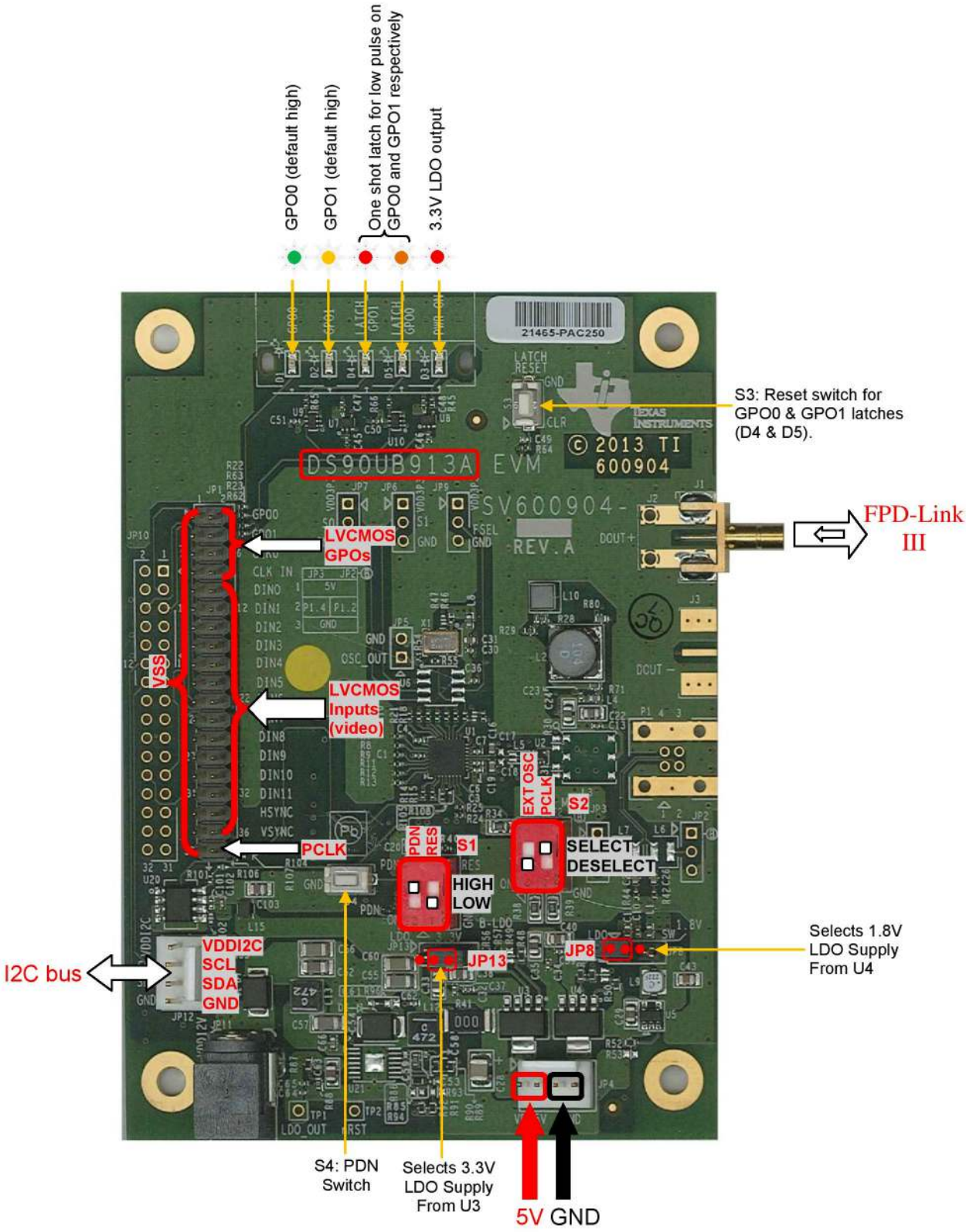


Figure 1-2. DS90UB913A-CXEVM REV A Serializer Board (Default Settings)

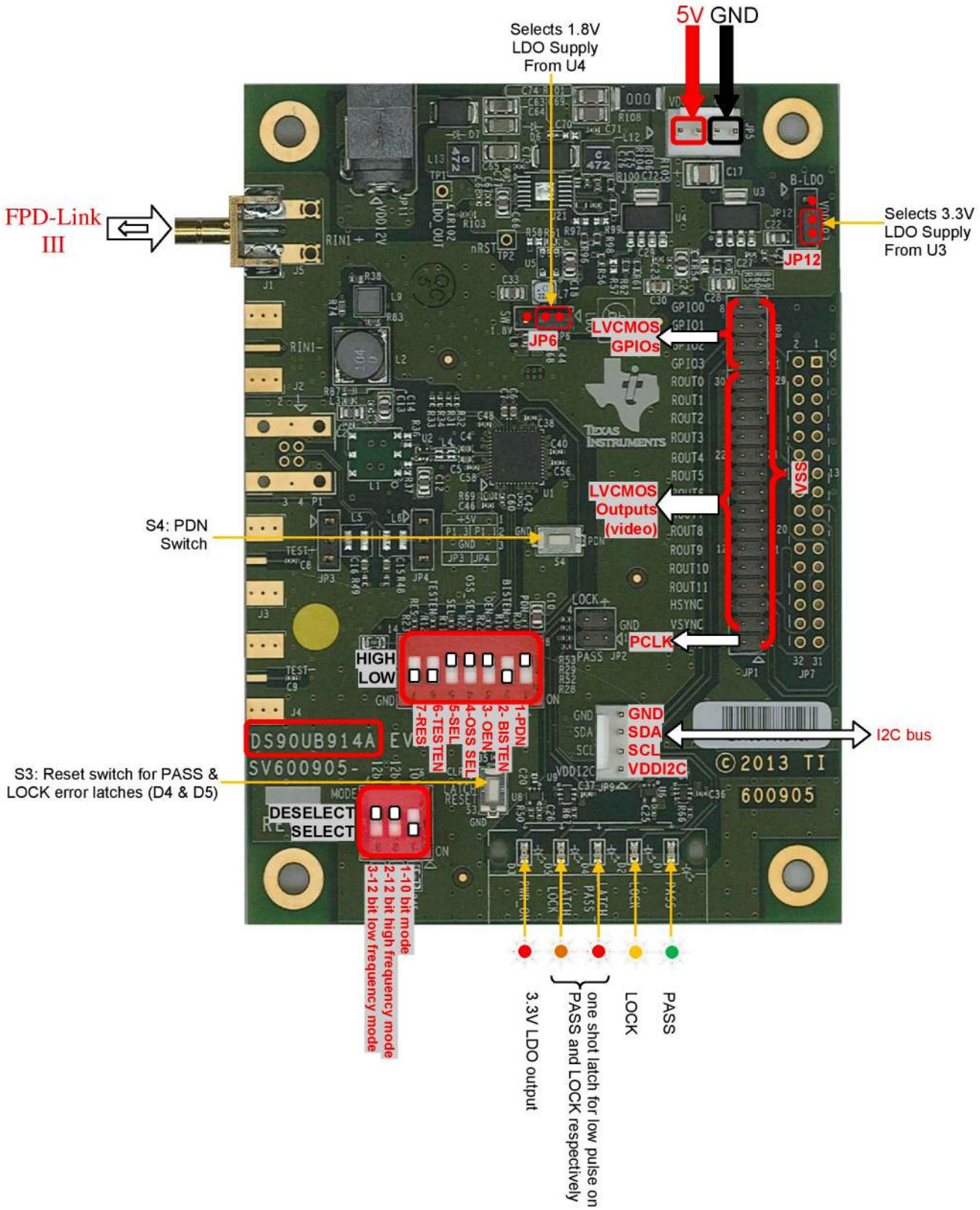


Figure 1-3. DS90UB914A-CXEVM REV A Deserializer Board (Default Settings)

1.3 Operation

Make sure S1, S2, JP8, JP13 of Serializer board and S1, S2, JP6, JP12 of Deserializer board are configured as shown in Figure 1-2 and Figure 1-3.

1. Connect the DS90UB913AQ and DS90UB914AQ Evaluation boards using a coax cable.
2. Connect the 5-V power supply to Deserializer board (recommended current limit is 300 mA) and apply power as shown in Figure 2-1.
3. Look for the LED D2 to light up on the DS90UB914AQ board.
   - If the LED is lit and stable, then the DS90UB914AQ is LOCKED to the FPD-Link III serial stream… CONGRATULATIONS, you are up and running!
   - If not, continue to the next section.

1.4 Troubleshooting the EVM setup

1. **Check power supply polarity.**

WARNING

Reverse supply polarity can damage the board.

2. Check to make sure there is sufficient current (300 mA) by checking that the voltage (5 V) is correct using DMM.
3. Check to make sure there is a FPD-Link III signal by probing on both C16 AND C19 on SER board and C6 AND C7 on DES board.
4. Monitor the LOCK signal at pin 4 (pin 3 is GND) of connector JP2 using oscilloscope on DES board. Do not rely on visual inspection of D2 (Lock LED) present on deserializer board.
5. With no PCLK input applied on SER board, PCLK output frequency on DES board should be 50MHz for the default settings.

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

Mode Selected	PCLK Output Expected
10 bit mode (default mode)	50 MHz
12 bit low frequency mode	25 MHz
12 bit high frequency mode	37.5 MHz

6. Go back to Figure 1-2 & Figure 1-3 to double check factory settings.

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 DS90UB913A/914A REV A EVM in detail.

2.1 Power Connections

1. Connect an external 5 V to pin 1 or 2 of JP5, on Deserializer board. (Refer to Figure 2-1)
2. Connect ground to pin 3 or 4 of JP5, on Deserializer board. (Refer to Figure 2-1)
3. Optionally, these boards can be configured for 12-V supply via Power Jack, JP11 on both the boards separately. However, this would require U21, TPS65320 to be mounted on Deserializer board, as it is not populated on the EVM.
4. 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.

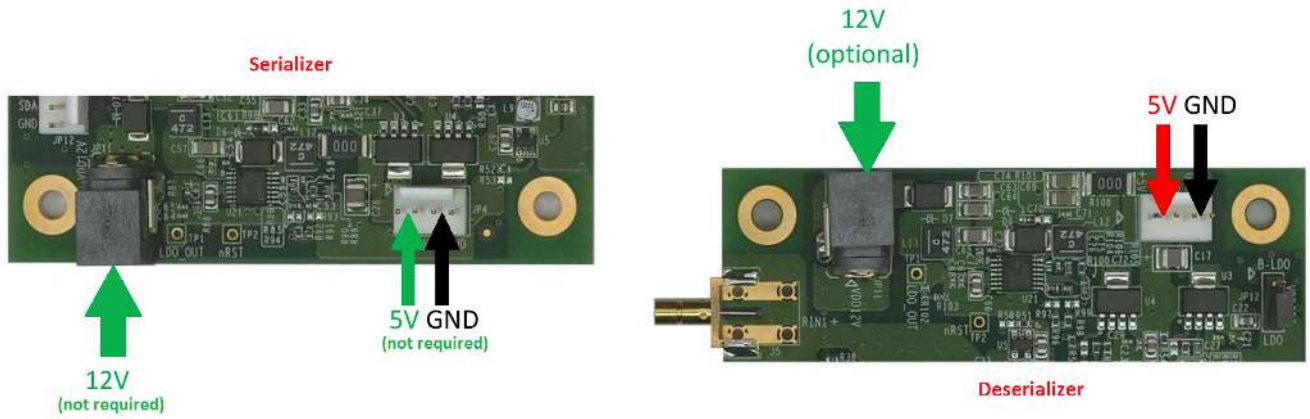


Figure 2-1. Powering DS90UB913A-CXEVM and DS90UB914A-CXEVM Boards

2.2 FPD-Link III Connection

J1 is the default SMB connector on both the boards. The FPD-Link III serial stream comes out of J1 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.

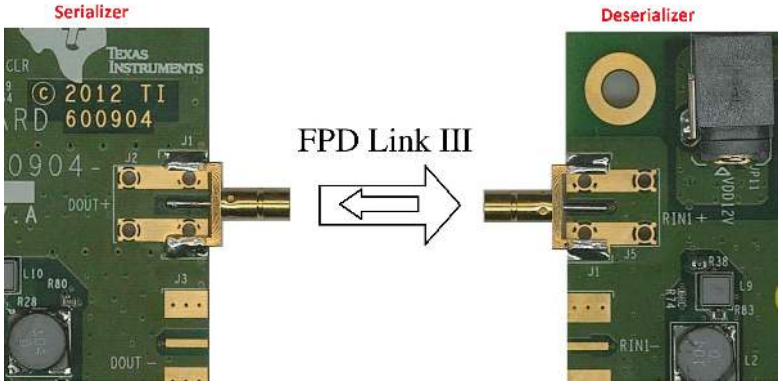
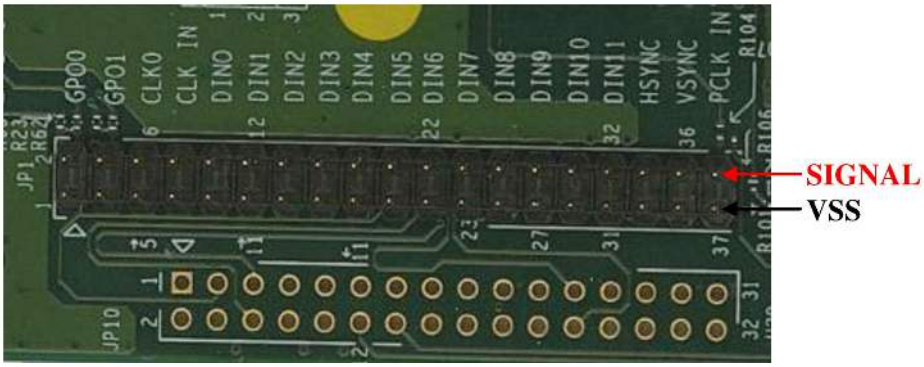


Figure 2-2. Serial Link Connection Using a Single 50-ω Coaxial Cable

2.3 LVCMOS Input Connector Description (on DS90UB913AQ Board)

JP1 – GPO0, GPO1, CLK OUT, CLK IN, DIN[11:0], HSYNC, VSYNC, PCLK IN are the input pins for the LVCMOS interface on Serializer board. The even numbered pins are the input signals. All the odd numbered pins are connected to VSS. Refer to Figure 2-3 below.



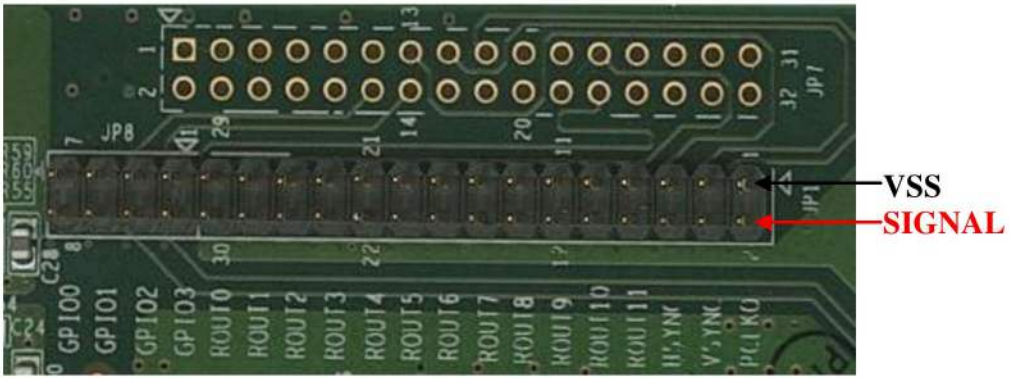
JP10 and JP1 pins are not connected.

Figure 2-3. Parallel Input Connector on Serializer Board

2.4 LVCMOS Output Connector Description (on DS90UB914AQ Board)

JP1 – ROUT[11:0], HSYNC, VSYNC, PCLKO are the pins of output connector for the LVCMOS interface on Deserializer board. The even numbered pins are the output signals. All the odd numbered pins are connected to VSS.

JP8 – GPIO0, GPIO1, GPIO2, GPIO3 are the access points for DS90UB914AQ GPIO data. Refer to Figure 2-4 below.



JP1 and JP7 pins are not connected.

Figure 2-4. Parallel Output Connector on Deserializer Board

2.5 Factory Set Switch Settings and Jumpers Default Configuration

2.5.1 Serializer Board Default Configuration

S1, S2, JP8 and JP13 of Serializer board are factory configured as shown in Figure 1-2 for plug and play operation.

1. The S1 switch is factory set as shown in Figure 2-5.
   The PDN switch (S1.2) is set HIGH and will turn on the DS90UB913AQ upon power up. This switch is connected to PDB pin of the device.
   The RES pin (S1.1) is pulled low as recommended by datasheet.

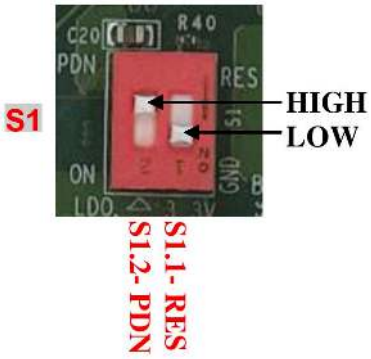
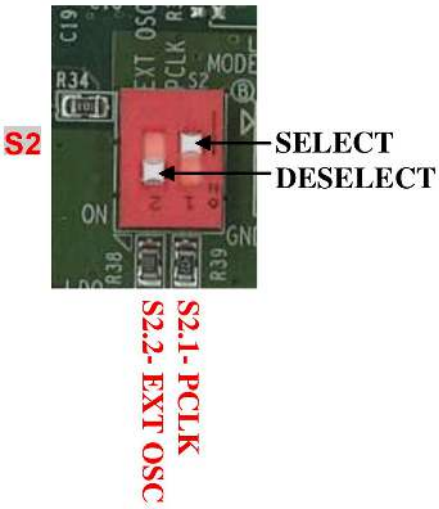


Figure 2-5. Switch S1: Default Settings on Serializer Board

2. The Mode Select switch, S2 is factory set as shown below in Figure 2-6 to use Serializer in PCLK from imager mode. To operate in external oscillator mode, move S2.1 to deselect position and S2.2 to select position (1). Refer device datasheet for more details on these modes.



Only one switch is allowed to be in SELECT mode at a time.

Figure 2-6. Switch S2: Default Settings on Serializer Board

3. S3 is a momentary switch, which is present on the top right corner of the SER board. Press this switch to clear the output of one shot latches for low pulse on GPO0 and GPO1.
4. S4 is a momentary switch for Transmitter Power Down.
5. On JP8 and JP13, a 2-pin jumper is factory placed as shown in Figure 1-2. This selects power from U4 for 1.8V VDD and from U3 for 3.3V VDDIO respectively.

(1) A power down and power up sequence through switch S1.2 is required, for the mode change to be effective.

2.5.2 Deserializer Board Default Configuration

S1, S2, JP6, JP12 of Deserializer board are factory configured as shown in Figure 1-3 for plug and play operation.

1. The S1 switch is factory set as shown below in Figure 2-7.
   (a) The PDN switch is set high and will turn on the Deserializer upon power up. This switch is connected to PDB pin of the device.
   (b) The OEN and OSS_SEL switch are set HIGH and will enable outputs to toggle upon power up.
   (c) The SEL switch is set high to select RIN1+/- input, which feeds serial stream data to the device from coax cable.
   Refer to Table 2-1 for more details.

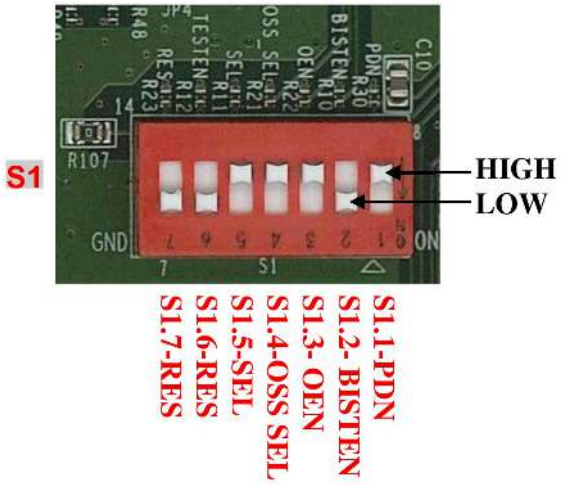
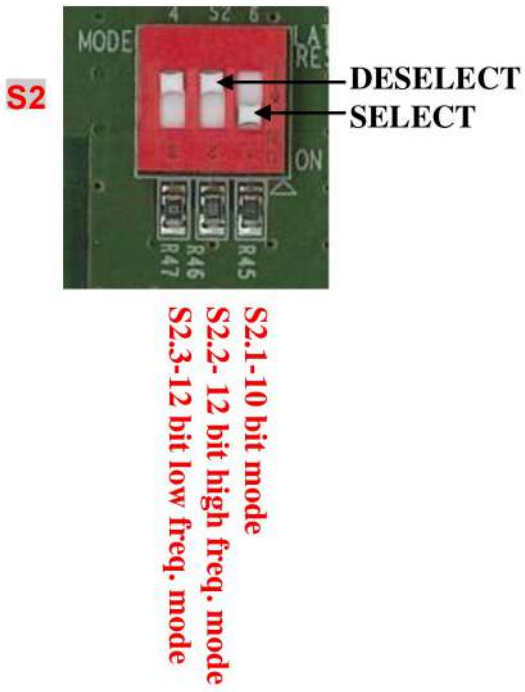


Figure 2-7. Switch S1: Default Settings on Deserializer Board

Table 2-1. Switch S1: Deserializer Board

Switch reference	Default Setting	Function
S1.1-PDN	High	High: Deserializer is enabled and is ON. Low: Deserializer is in Sleep (power down mode). In this mode, programmed control register data are NOT retained and reset to default values.
S1.2-BISTEN	Low	High: BIST Mode Enabled Low: BIST Mode Disabled
S1.3-OEN	High	Refer table on "Output States" in the device datasheet
S1.4-OSS SEL		
S1.5-SEL	High	High: RIN1+/- input is selected as the active channel on the Deserializer. Low: RIN0+/- input is selected as the active channel on the Deserializer.
S1.6-RES	Low	Reserved and must be set Low always.
S1.7-RES		

2. The S2 switch is factory set as shown below in Figure 2-8. This will configures the SER/DES link in 10 bit mode.



Only one switch is allowed to be in SELECT mode at a time.

Figure 2-8. Switch S2: Default Settings on Deserializer Board

Table 2-2. Switch S2: Deserializer Board

Switch reference	Default Setting	Frequency Range supported	Function
S2.1 - 10 bit mode	Select	50MHz to 100MHz	When SELECTed, configures device in 10 bit mode and hence LVCMOS input DIN10, DIN11 and LVCMOS output ROUT10, ROUT11 can not be used.
S2.2 - 12 bit high frequency mode	Deselect	37.5MHz to 75MHz	When SELECTed, configures device in 12 bit high frequency mode
S2.3 - 12 bit low frequency mode	Deselect	25MHz to 50MHz	When SELECTed, configures device in 12 bit low frequency mode

3. S3 is a momentary switch located at the bottom center of the DES board. Press this switch to clear the output of latches for low pulse on LOCK and PASS.
4. S4 is a momentary switch for Receiver Power Down.
5. On JP6 and JP12, a 2-pin jumper is factory placed as shown in Figure 1-3. This selects power from U4 and U3 LDOs for 1.8V VDD and 3.3V VDDIO respectively.

Using I²C

3.1 Default Addresses

The default 7-bit I²C address of DS90UB913AQ is set to 0x58 (101 1000) using suitable resistor divider on ID[x] pin. Also, 7-bit I²C address of DS90UB914AQ is set to 0x60 (110 0000) using suitable resistor dividers on pins IDx[0] and IDx[1]. Change resistor R25 on Serializer board and R32, R33 on Deserializer board to change the address of these devices, refer device datasheet for more information.

3.2 USB2ANY (1)

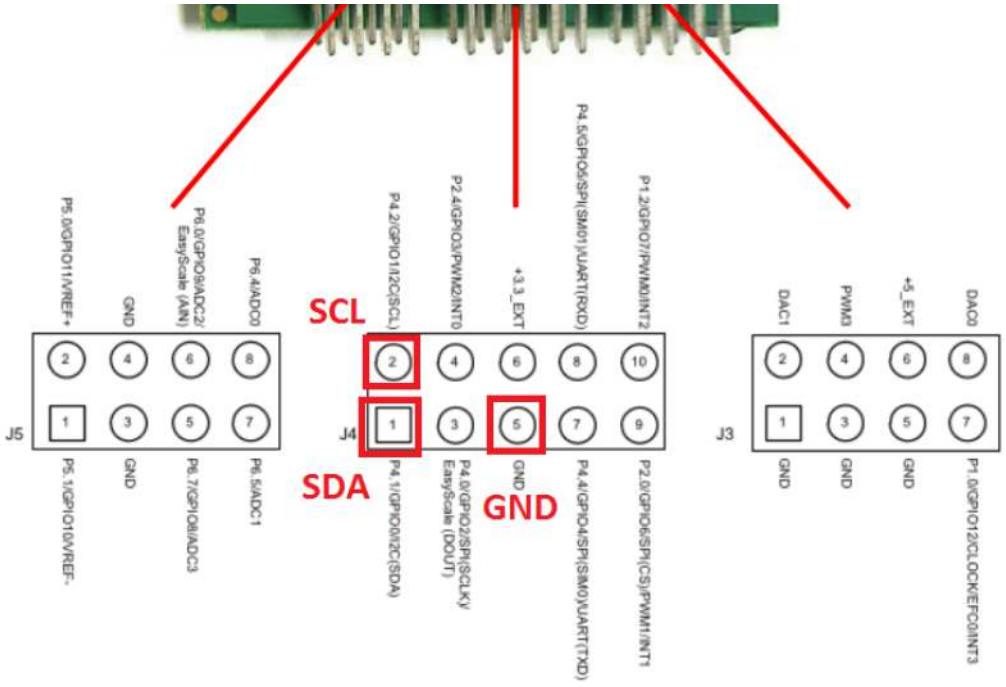
The USB2ANY is required to use interactive GUI over I²C, such as ALP (Analog LaunchPAD).
Download and install ALP from: http://www.ti.com/tool/ALP.
Before using ALP for these devices, it is also required to download DS90UB913-914-ALP-PROFILES from the same web page and copy DS90UB913 and DS90UB914 folders to location: *Program Files\Texas Instruments\Analog LaunchPAD vx.xx.xxxx\Profiles* on your system.
The USB2ANY is shown in Figure 3-1 below. It is powered through the USB port of computer and LED D1 will light up GREEN when the USB2ANY is connected to a computer to indicate that the board is powered.

Figure 3-1. USB2ANY

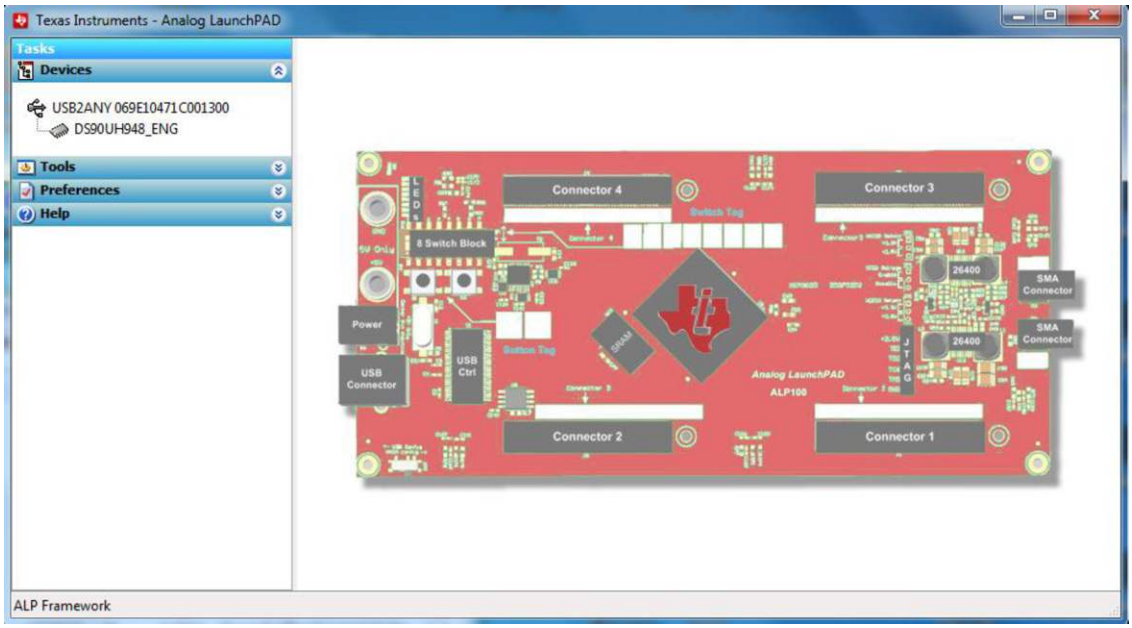
Refer to Figure 1-2 and Figure 1-3 for these connections.

(1) Any I²C controller which support clock stretching can be used.

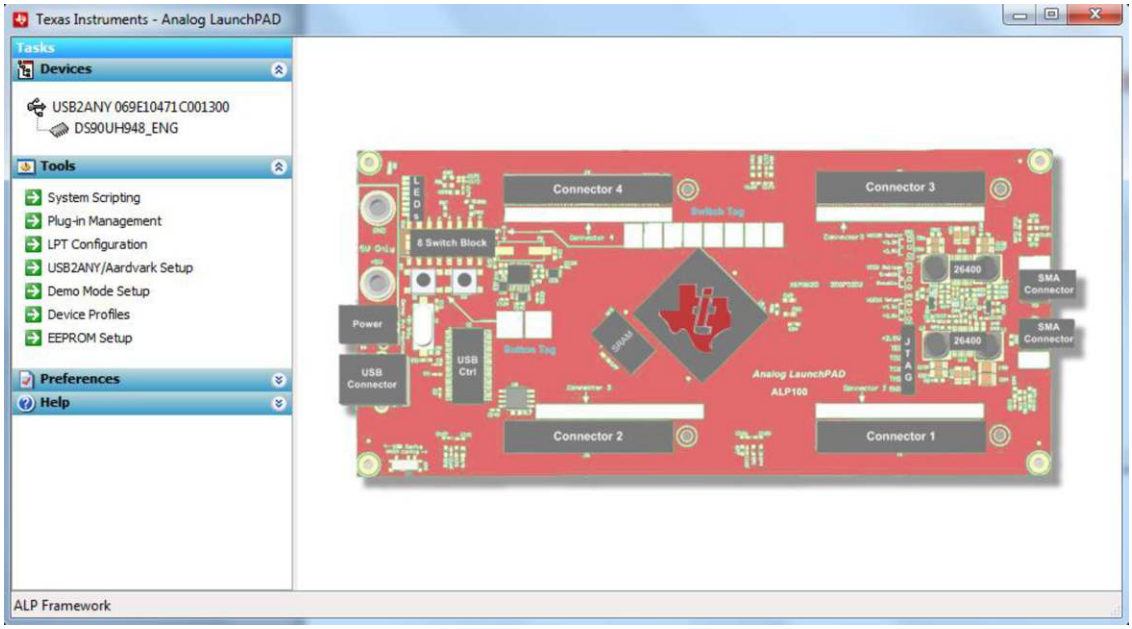
Here is the USB2ANY pinout with the I²C pins highlighted. We typically use jumper wires to connect these to the 913/914 EVMs.



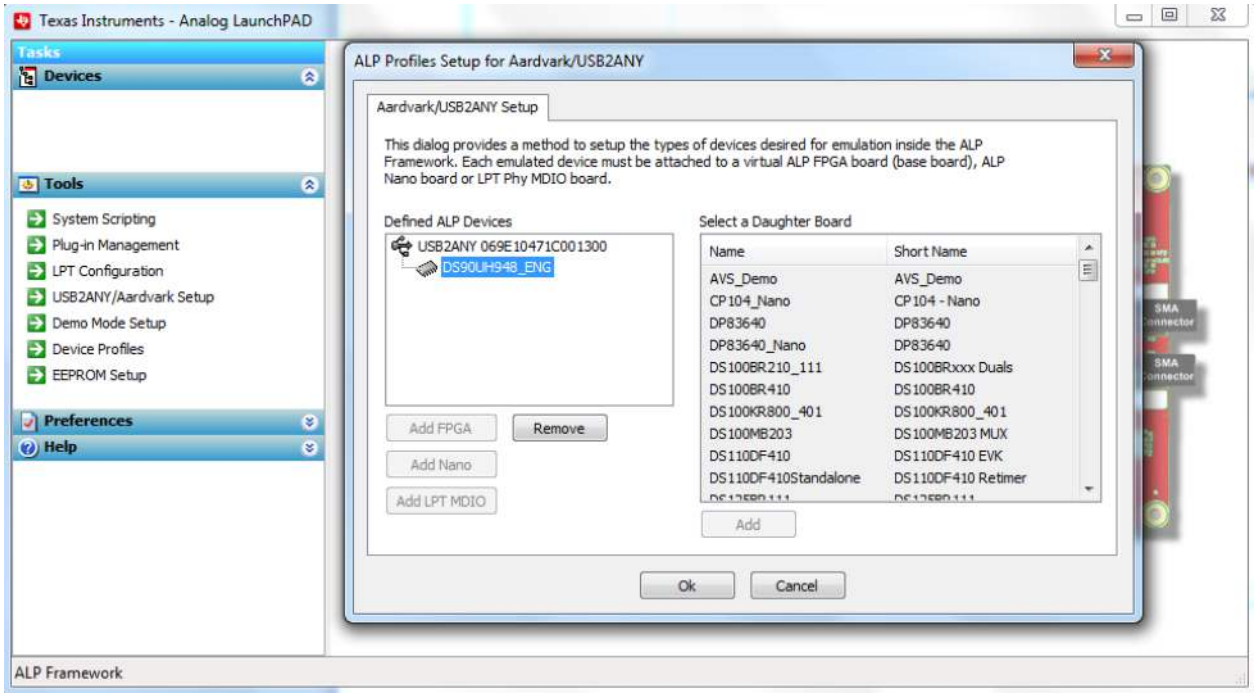
This is what ALP should look like when launched while connected to a USB2ANY. The part number on the left may be different, or there may not be one, but the key is that it will say *USB2ANY…* under Devices.



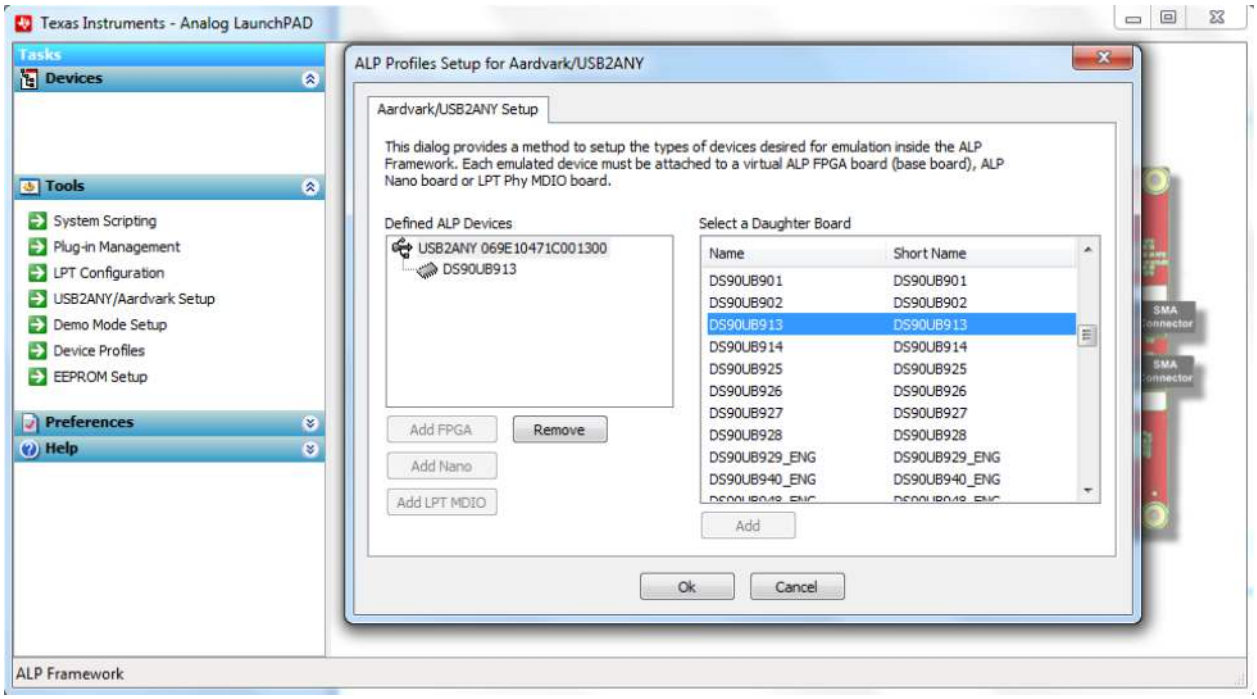
Expand the Tools panel and select USB2ANY/Aardvark Setup.



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



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.*



Additional Features

4.1 Eye Monitor – CMLOUTP/N

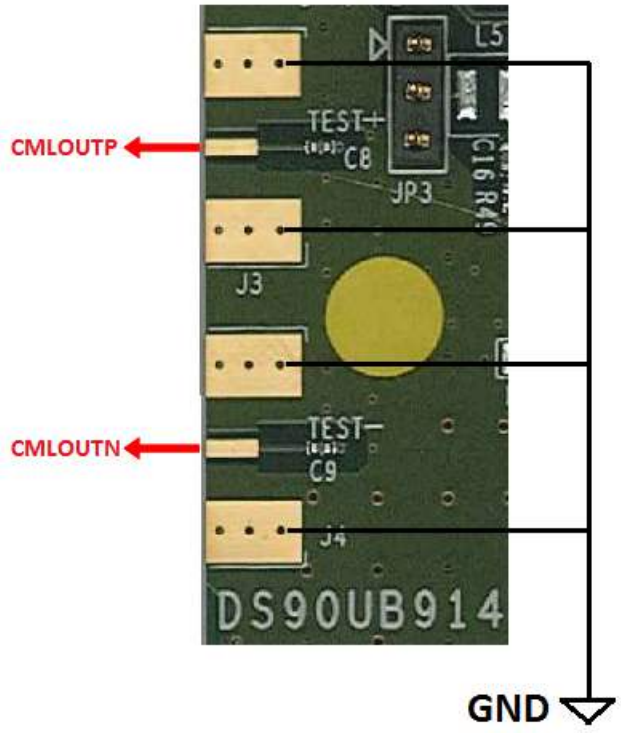


Figure 4-1. Top View of CML Access Points on Deserializer Board

Connector J3 connects CMLOUTP (or TEST+) and J4 connects to CMLOUTN (or TEST-), which are present on left hand side of DS90UB914A-CXEVM board. CMLOUTP/N must be enabled by register, 0x3F[4] = 0, to be able to monitor the FPD-Link III serial stream.

4.2 Differential Operation Over a Pair of Coax Cables

For differential operation,

1. On DS90UB913A-CXEVM board, change C19 to 0.1 µF, remove R80 and mount J3.
2. On DS90UB914A-CXEVM board, change C7 to 0.1 µF, remove R74 and mount J2.

4.3 Use of Optional Rosenberger HSD Connector with STP Cable

Following changes are required for using an STP cable with the EVM,

1. On Serializer board, depopulate C16 and C19 capacitors and populate the C17 and C18, 0.1 µF. Also, populate P1 (Rosenberger HSD connector).
2. On Deserializer board, depopulate C6 and C7 capacitors and populate the C4 and C5, 0.1 µF. Also, populate P1 (Rosenberger HSD connector).
3. Set the pin 5 of switch S1 LOW on DES board, to accept input from RIN0+/-.

This configuration will require Serializer and Deserializer both to be powered separately. To enable power over STP there are two options available as shown in Figure 4-2 and Figure 4-3:

1. To transmit power over the pair carrying data, mount R30 (0Ω), R31 (0Ω), L3 on SER board and R36 (0Ω), R37 (0Ω), L1 on DES board. (5)
2. To transmit power over unused pair of STP cable,
   On SER board,
   - Mount L6 (10 µH), L7 (10 µH)
   - Put jumpers across pin 1 and pin 2 of jumpers JP2
   - Put jumpers across pin 2 and pin 3 of jumpers JP3

   On DES board,
   - Mount L5 (2.7 µH), L6 (2.7 µH)
   - Put jumpers on JP3 and JP4 to match the polarity of supply (check on pin2 of each header)

(5) Refer Schematic and BOM section for specification.

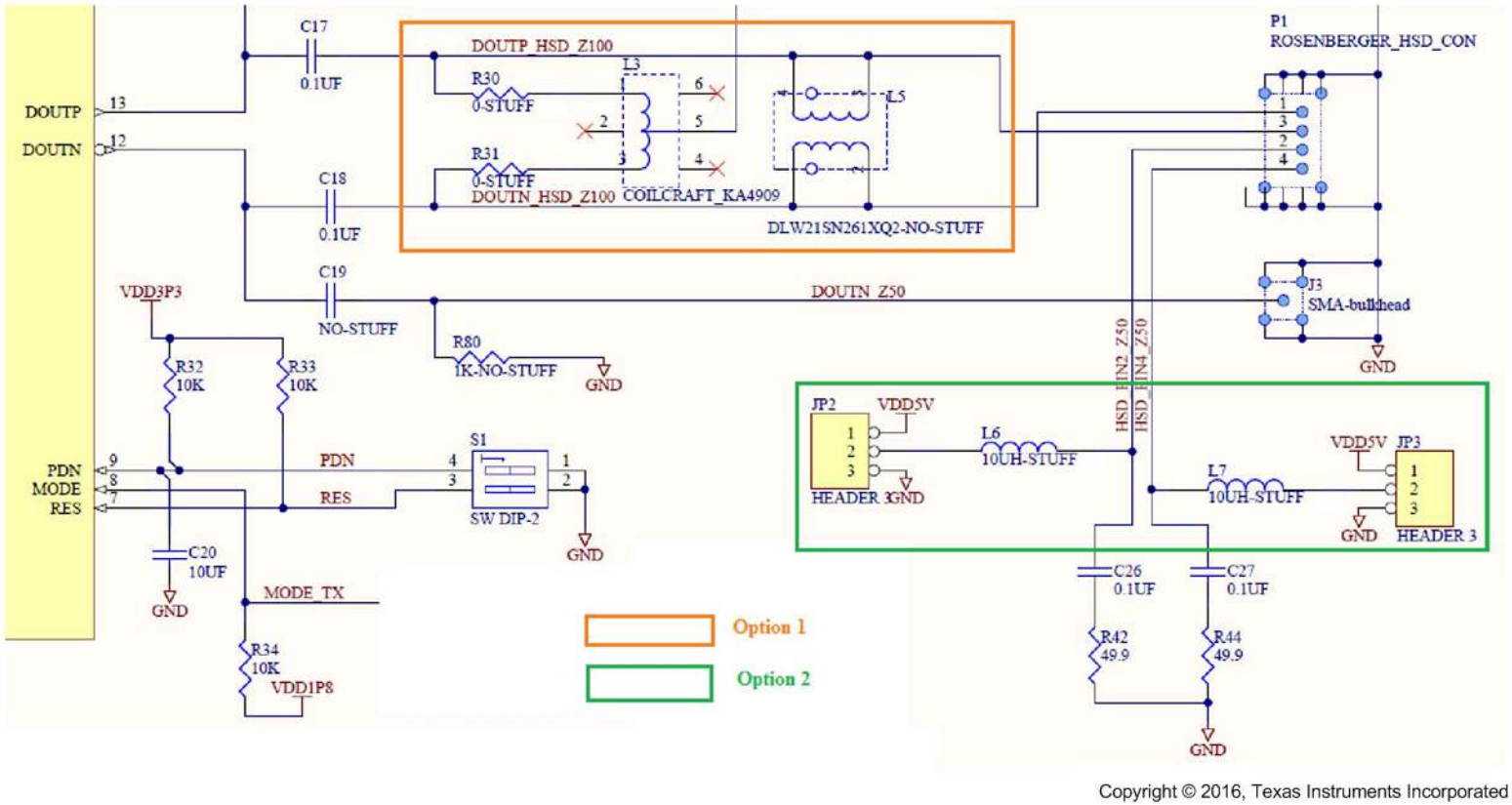


Figure 4-2. Power Over STP: SER Configuration

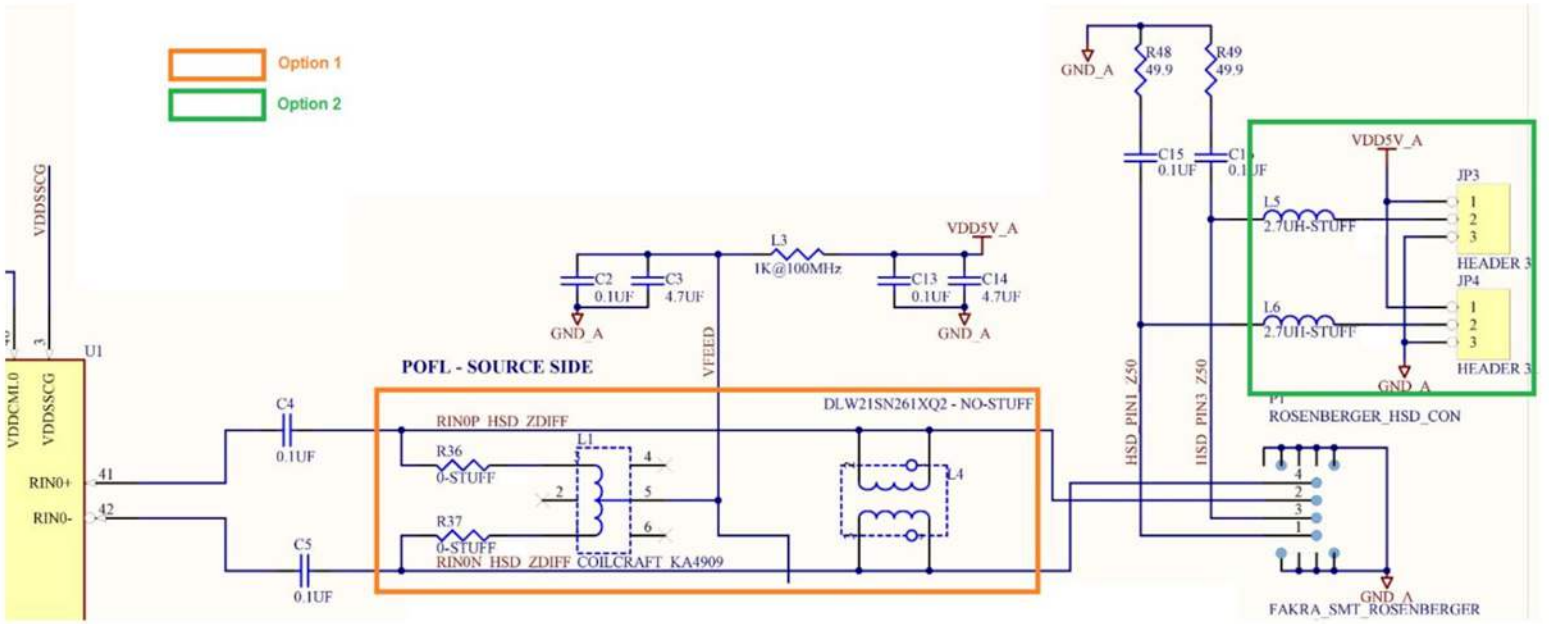


Figure 4-3. Power Over STP: DES Configuration

4.4 Optional Use of Header Provided for External Imager and Host

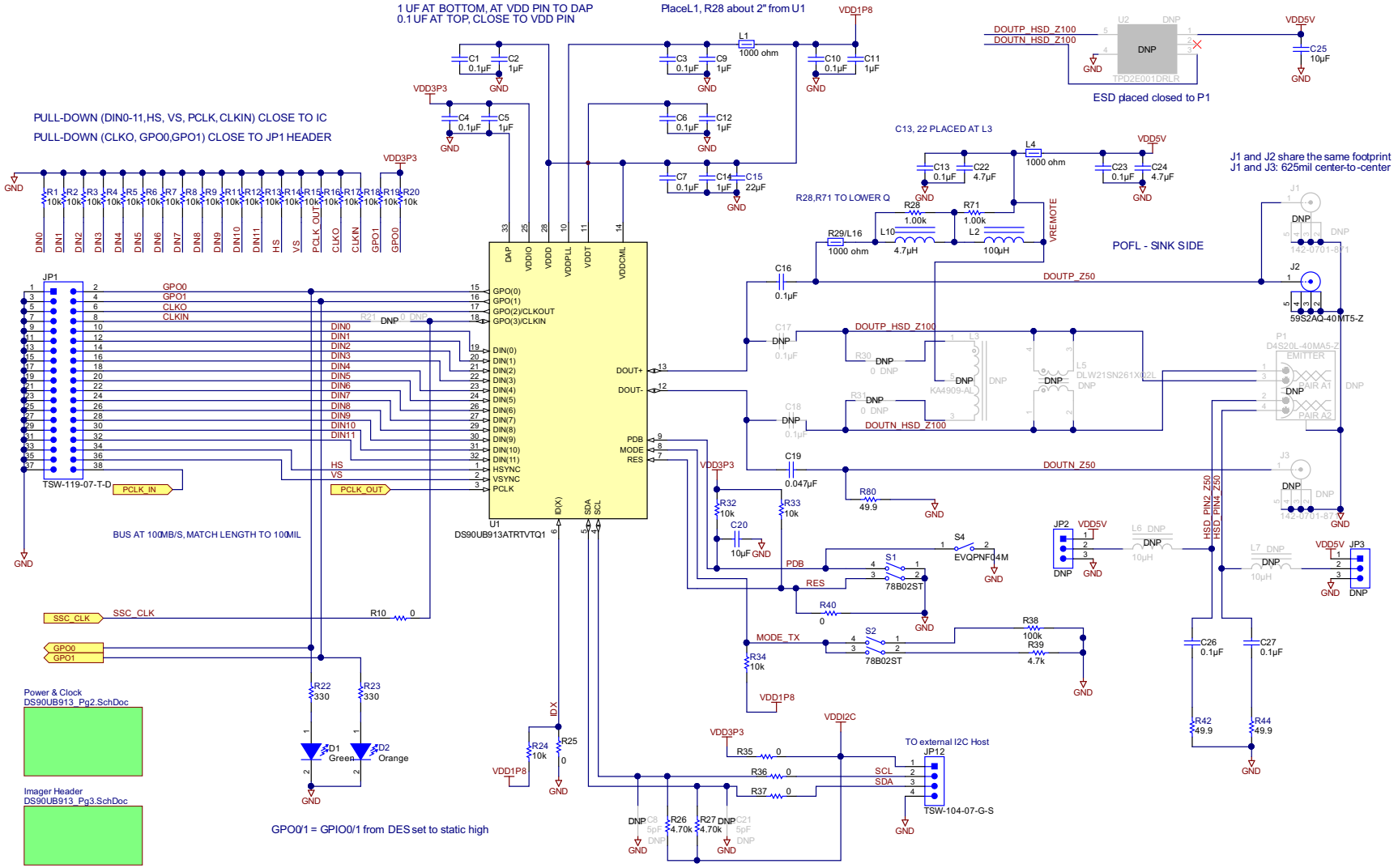
This hardware configuration allows connecting an external imager (OV10630) to DS90UB913AQ Serializer and an external host (PIXCI ECB1-34 Base camera link express card/frame grabber) to DS90UB914AQ Deserializer board. To operate in this configuration, the following hardware changes are required:

1. On Serializer board, populate JP10, R67, R68, R69, R70, R72, R73, R75, R76, R77, R78, R79, R81, R82, R83, R84. It is recommended to remove JP1.
2. On Deserializer board, populate JP7, R70, R71, R72, R73, R75, R76, R77, R78, R79, R80, R81, R82, R84, R85, R86. It is recommended to remove JP1.

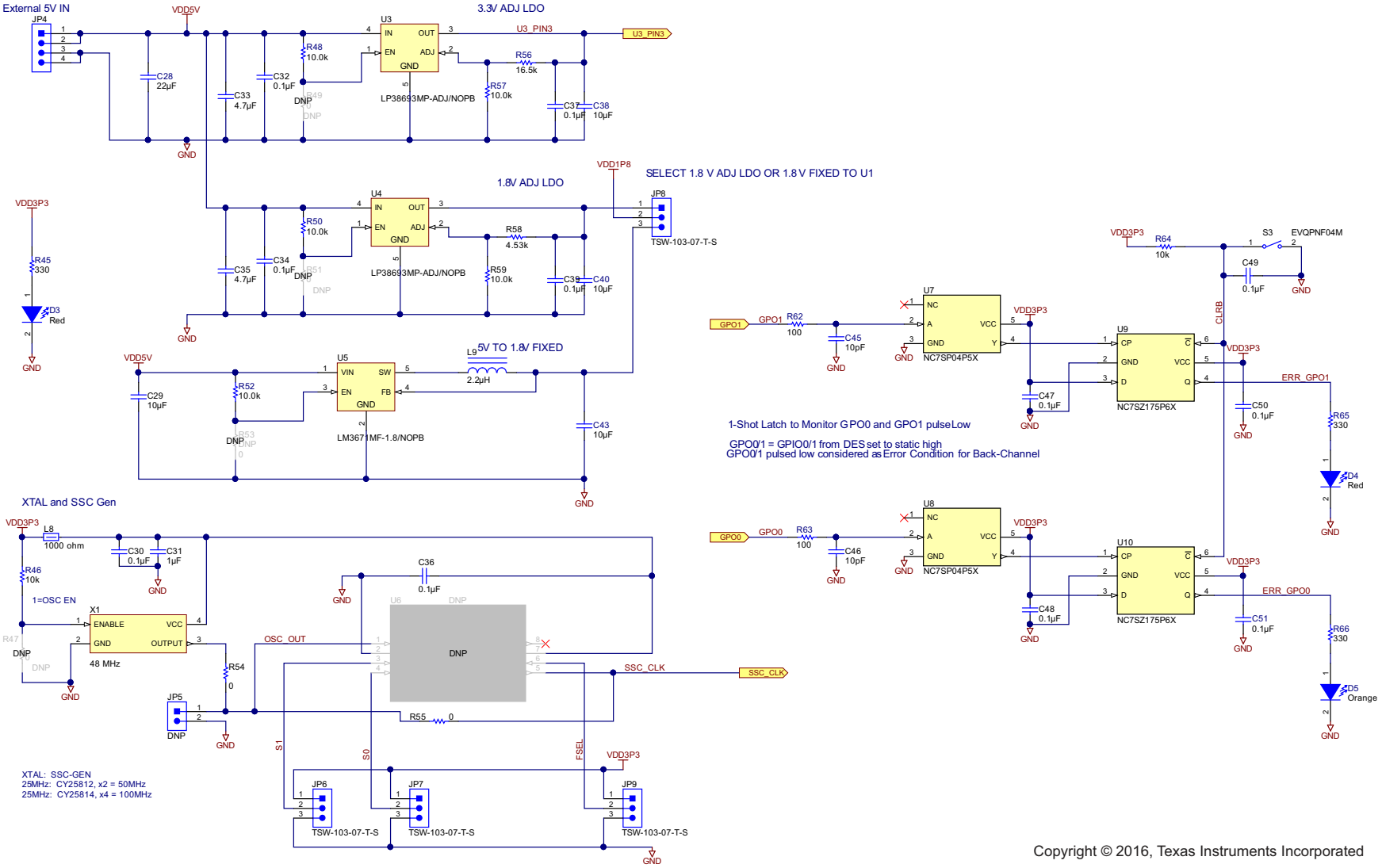
Schematics

A.1 DS90UB913A-CXEVM Serializer Board Schematic

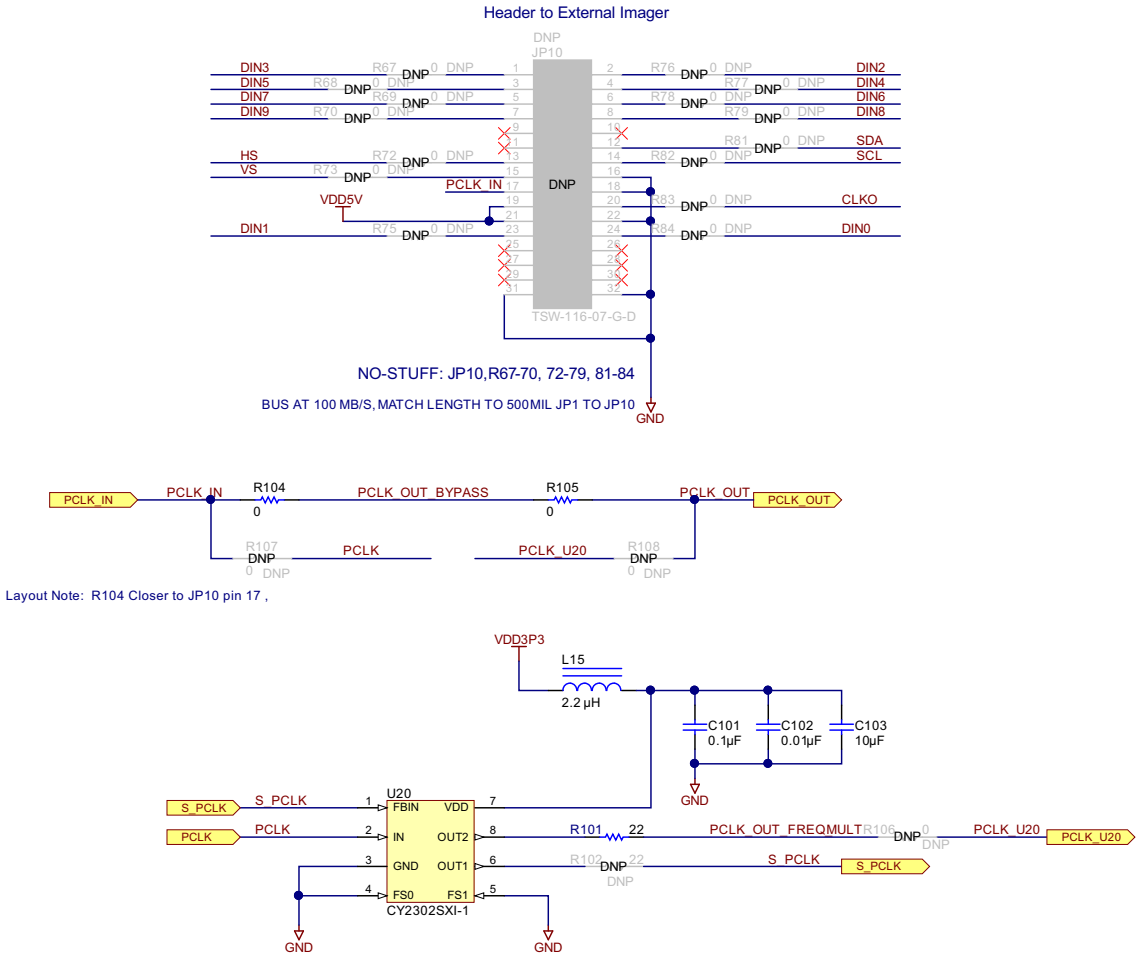
1. DS90UB913AQ Serializer



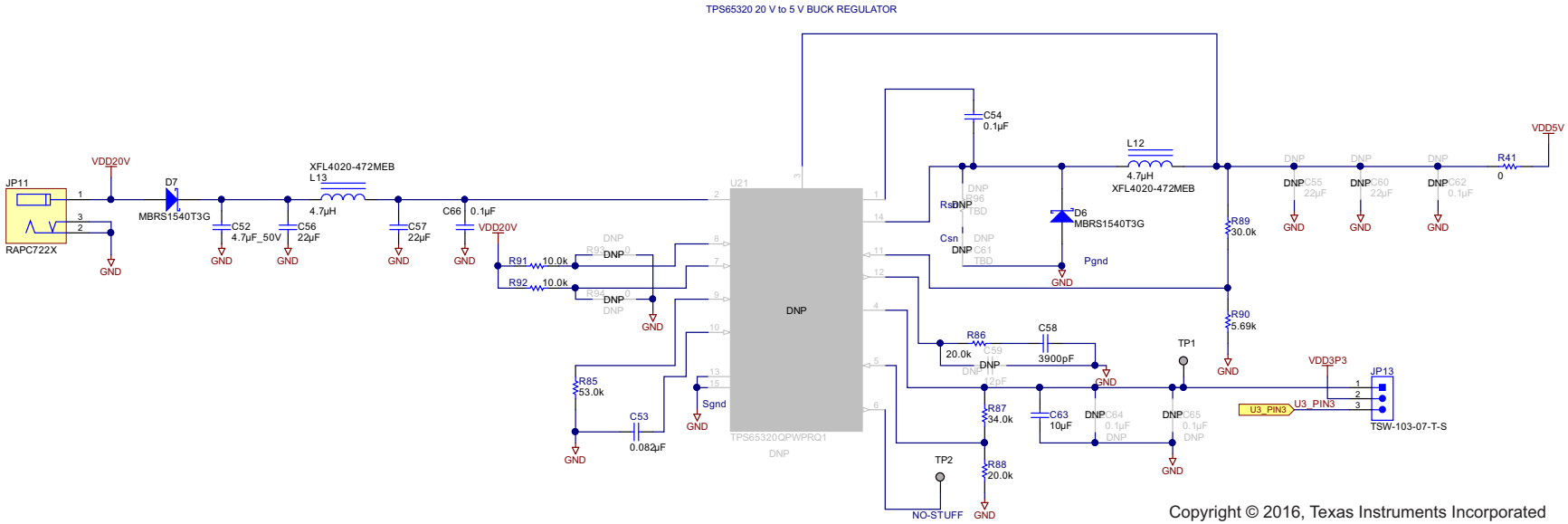
2. Power to Serializer Board



3. Header Adapter to Imager for Serializer Board

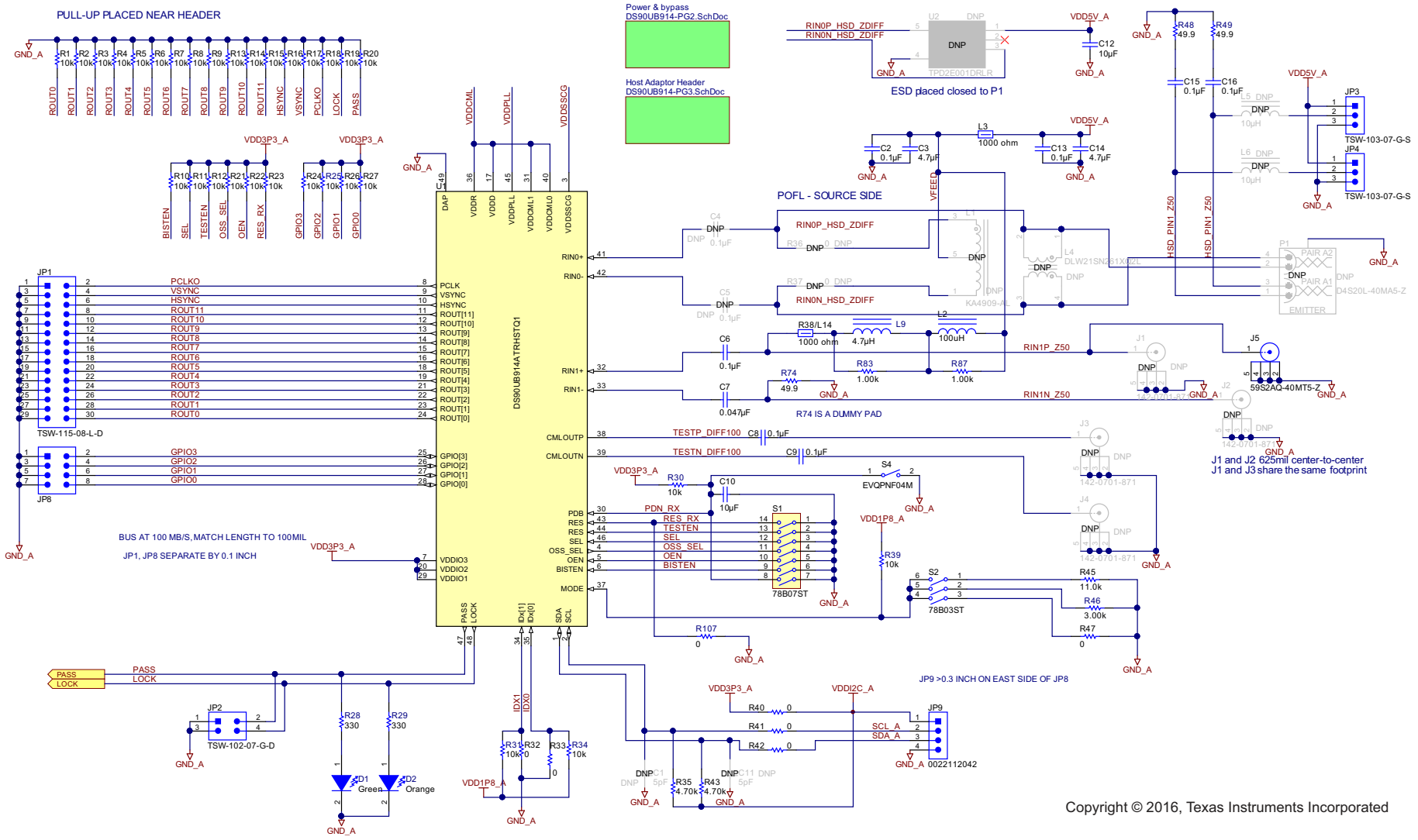


4. Buck Regulator on Serializer Board

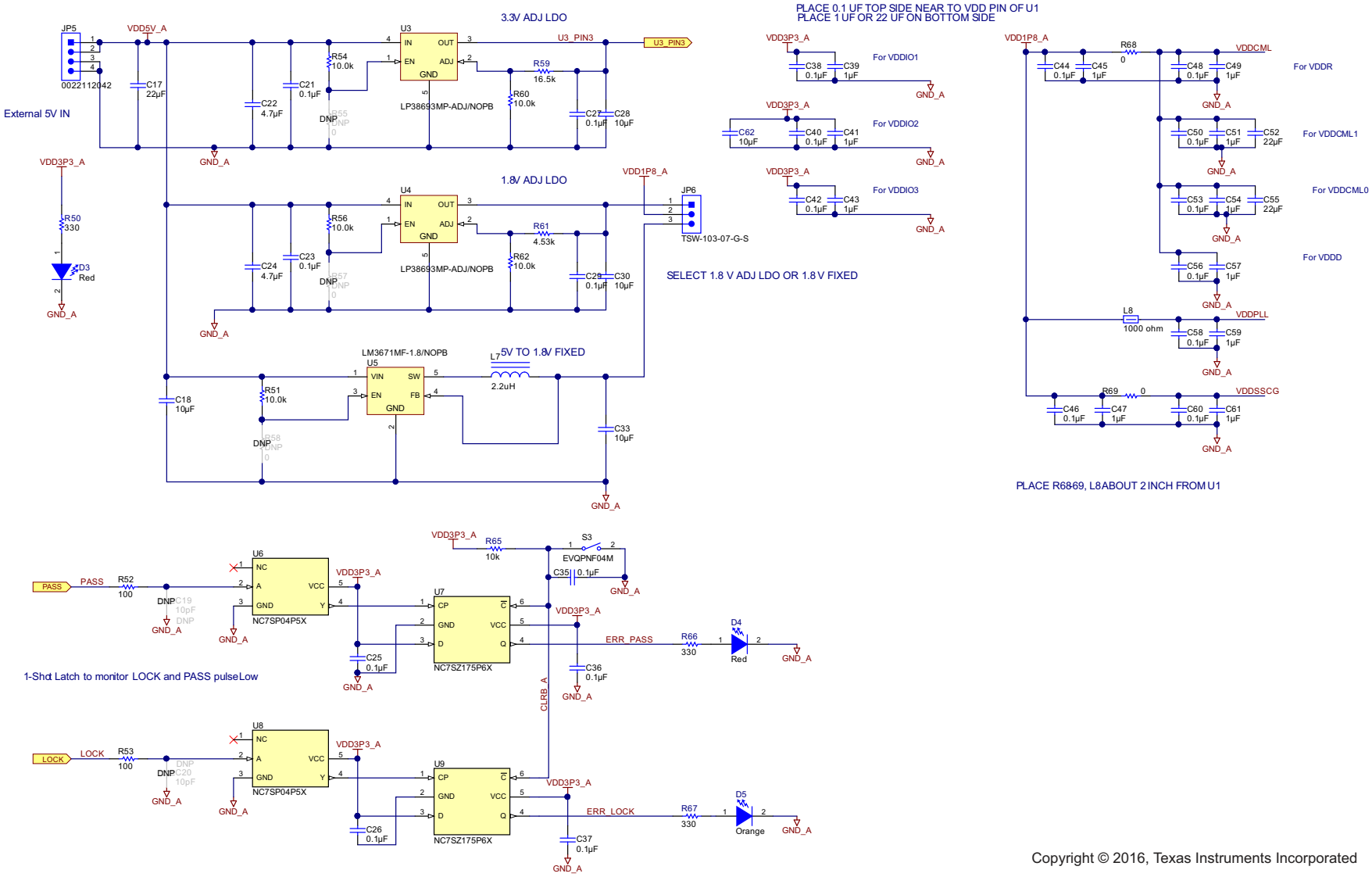


A.2 DS90UB914A-CXEVM Deserializer Board Schematic

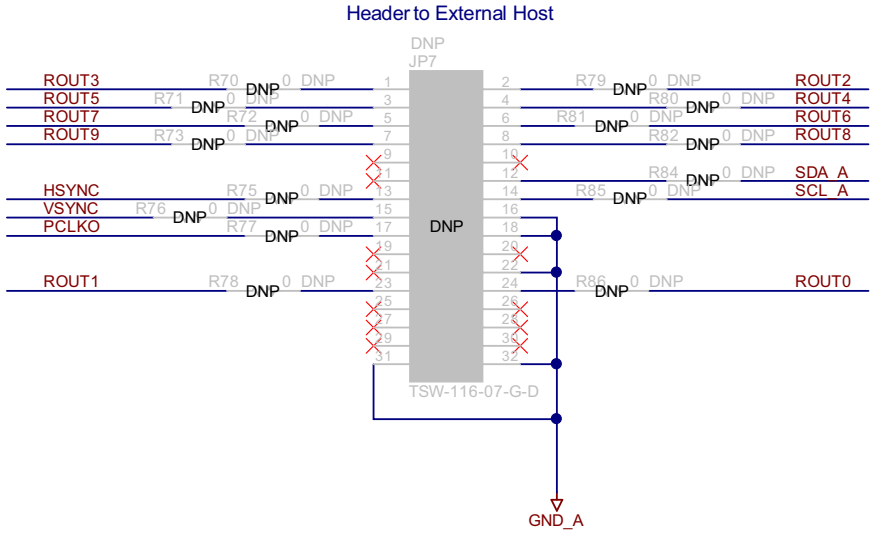
1. DS90UB914AQ Deserializer



2. Power to Deserializer Board

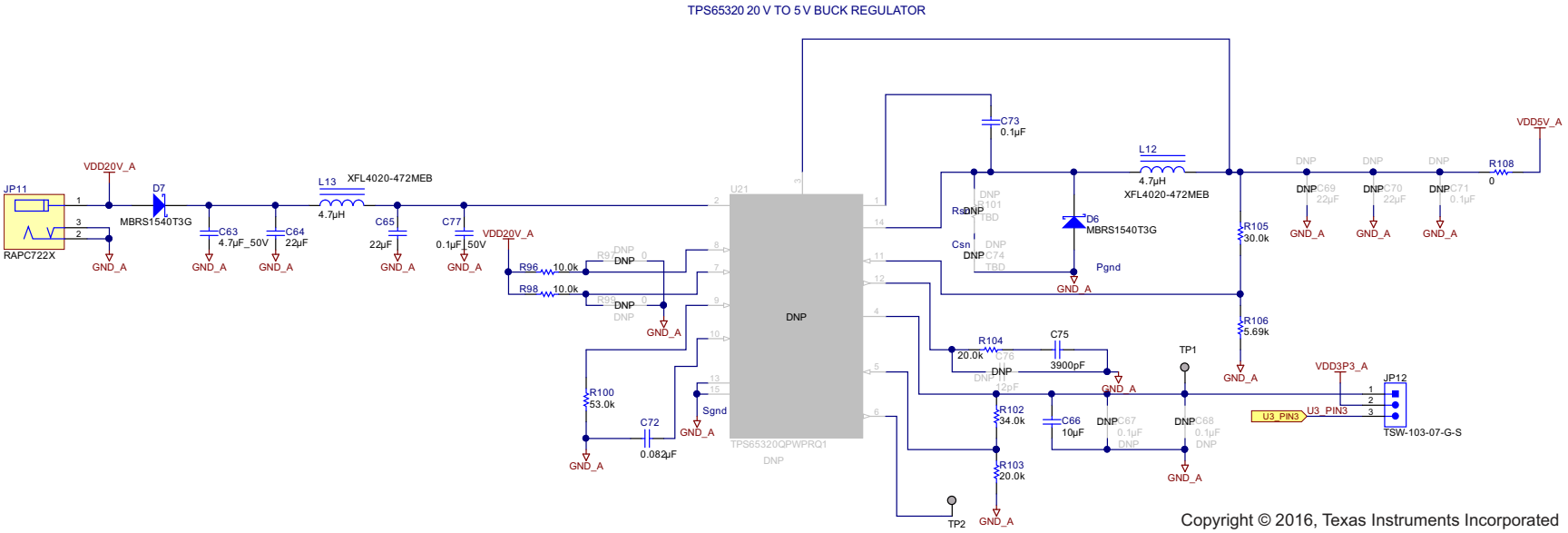


3. Header Adapter for Deserializer Board



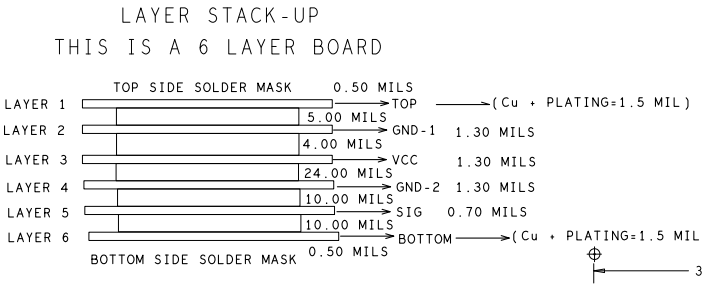
NO-STUFF: JP7,R70-73,R75-82,R84-86

4. Buck Regulator on Deserializer Board

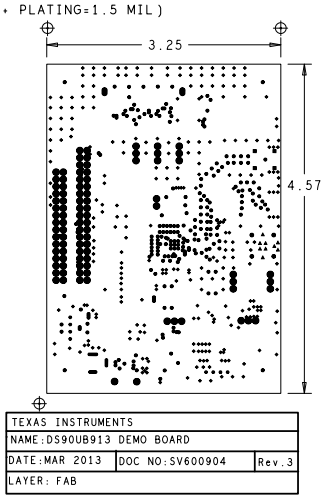


B.1 DS90UB913A-CXEVM Serializer Board Layout

1. DS90UB913A-CXEVM Stackup & FAB Notes

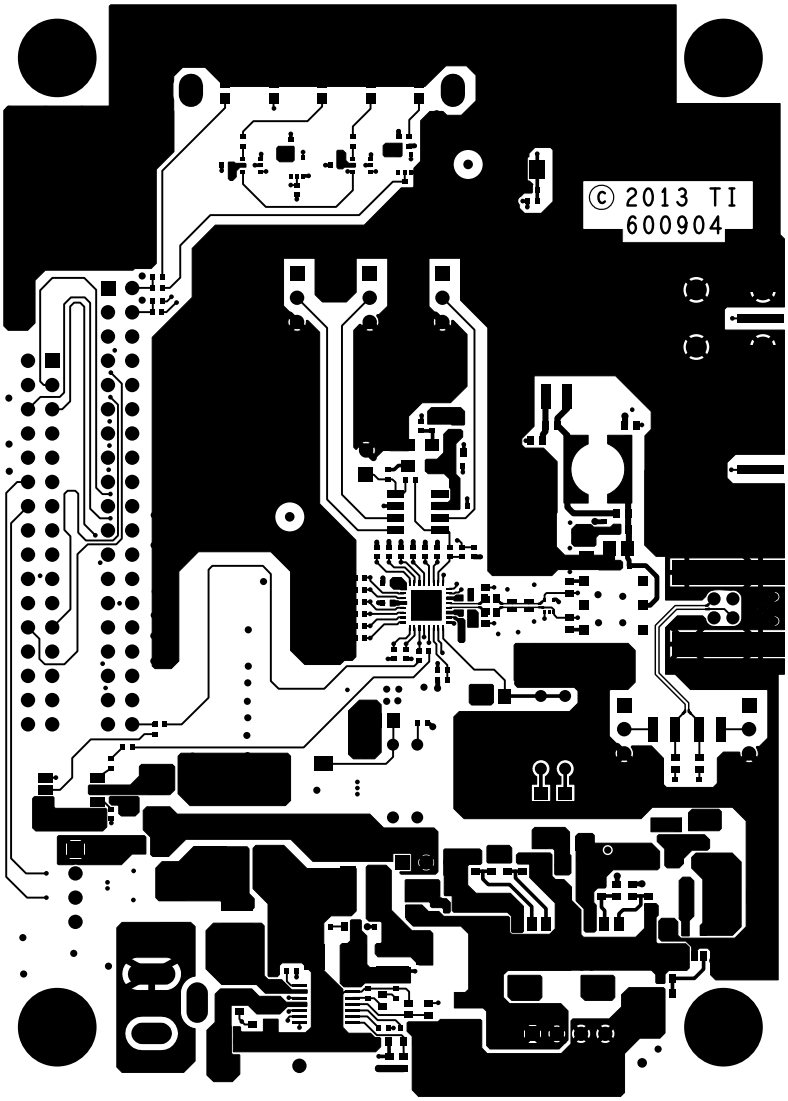


DRILL CHART: TOP to BOTTOM				
ALL UNITS ARE IN MILS				
FIGURE	SIZE	TOLERANCE	PLATED	QTY
•	8.0	+3.0/-3.0	PLATED	9
•	10.0	+3.0/-3.0	PLATED	226
•	15.0	+3.0/-3.0	PLATED	293
▲	16.0	+3.0/-3.0	PLATED	5
•	30.0	+3.0/-3.0	PLATED	8
▲	35.0	+3.0/-3.0	PLATED	4
●	40.0	+3.0/-3.0	PLATED	95
•	40.0	+3.0/-3.0	PLATED	1
•	40.0	+3.0/-3.0	PLATED	3
•	40.0	+3.0/-3.0	PLATED	1
•	40.0	+3.0/-3.0	PLATED	3
■	62.99	+3.0/-3.0	PLATED	4
•	65.0	+3.0/-3.0	PLATED	4
•	156.0	+3.0/-3.0	PLATED	1
▮	123.11x44.37	+3.0/-3.0	PLATED	1
▬	123.11x44.37	+3.0/-3.0	PLATED	1
▬	142.8x44.37	+3.0/-3.0	PLATED	1
⬮	118.0x79.0	+2.0/-2.0	NON-PLATED	2

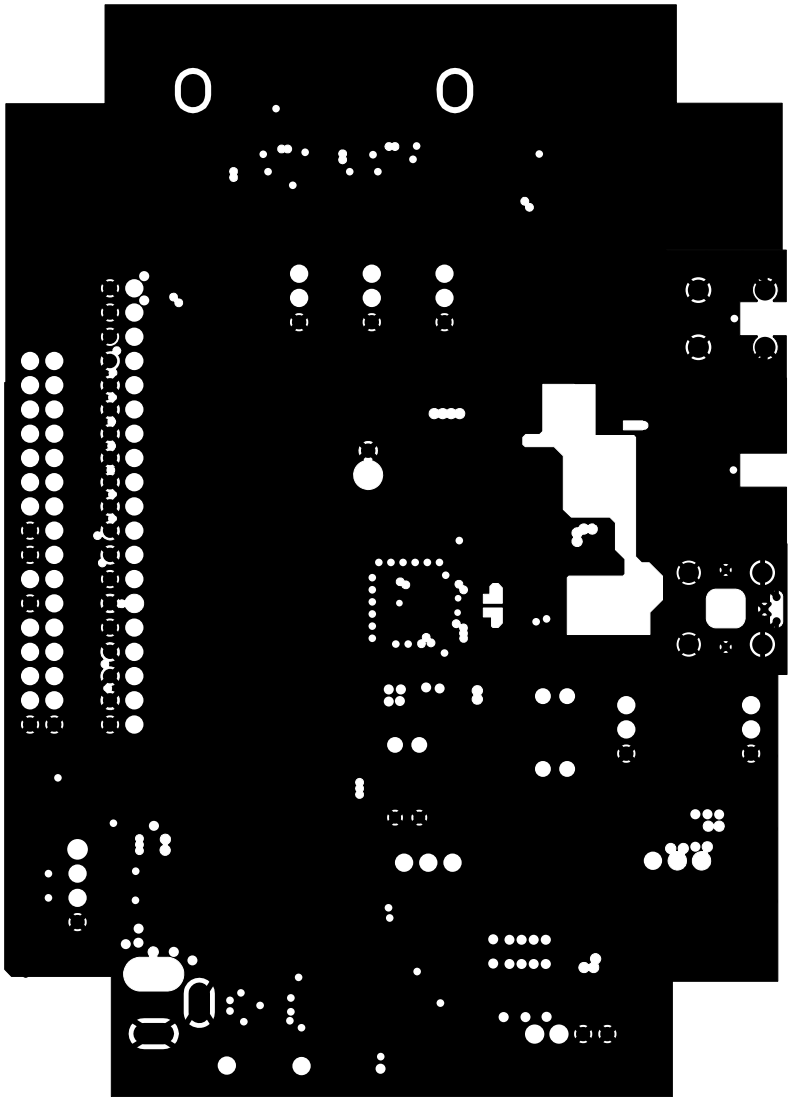


NOTES (UNLESS OTHERWISE SPECIFIED):
1. BOARD THICKNESS : 62 +/- 4 MILS
2. DIELECTRIC : FR4
3. NUMBER OF LAYERS: 6.
4. SOLDERMASK : LPI GREEN.
5. SILKSCREEN : WHITE EPOXY INK.
6. NO VENDOR LOGO OR NAME ON THE BOARD.
7. REMOVE THE NON-FUNCTIONAL PADS ON ALL INNER LAYERS.
8. PLATING : SOFT IMMERSION GOLD.
9. MAXIMUM WARP AND TWIST SHALL NOT EXCEED .005 PER INCH.
10. ANY CHANGES MADE BY THE PCB FABRICATOR TO THE FILM OR THE GERBER FILES MUST BE APPROVED BY TEXAS.
11. DEBURR ALL SHARP EDGES.
12. BOARD DIMENSIONS ARE IN INCHES.
13. 8 MIL TRACES REQUIRES 50 OHM +/-5 OHM SINGLE ENDED IMPEDANCE ON TOP LAYER AND SIGNAL LAYER.
6/9/6 TRACES REQUIRE 100 OHM +/-5 OHM DIFFERENTIAL IMPEDANCE ON TOP LAYER.
6/7/6 TRACES REQUIRE 100 OHM +/-5 OHM DIFFERENTIAL IMPEDANCE ON SIGNAL LAYER(LAYER 5).
14. THIS BOARD SHOULD BE LEAD FREE.

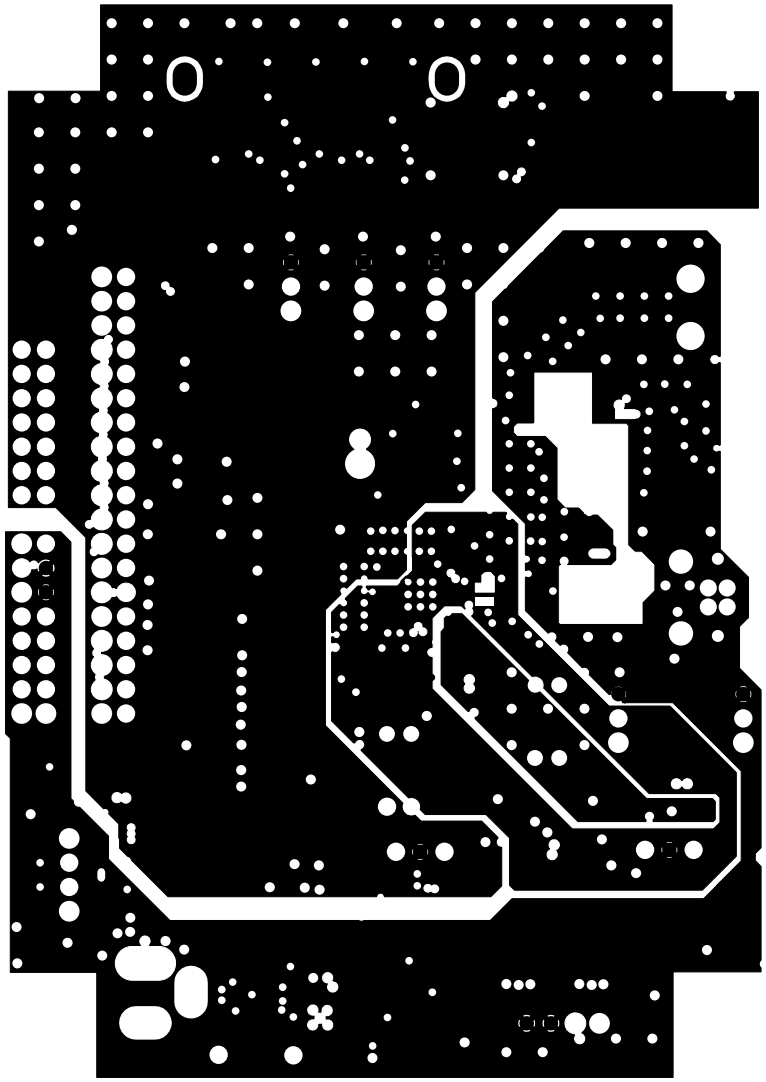
2. Layer 1 - TOP



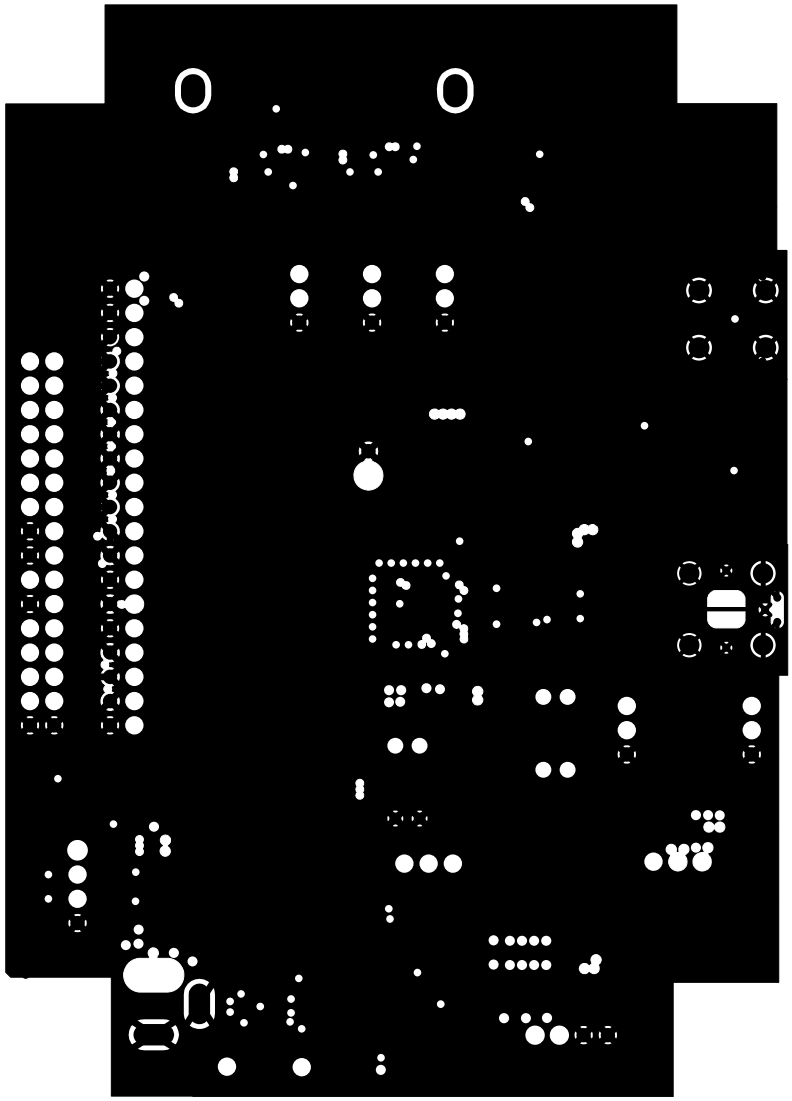
3. Layer 2 - GND-1



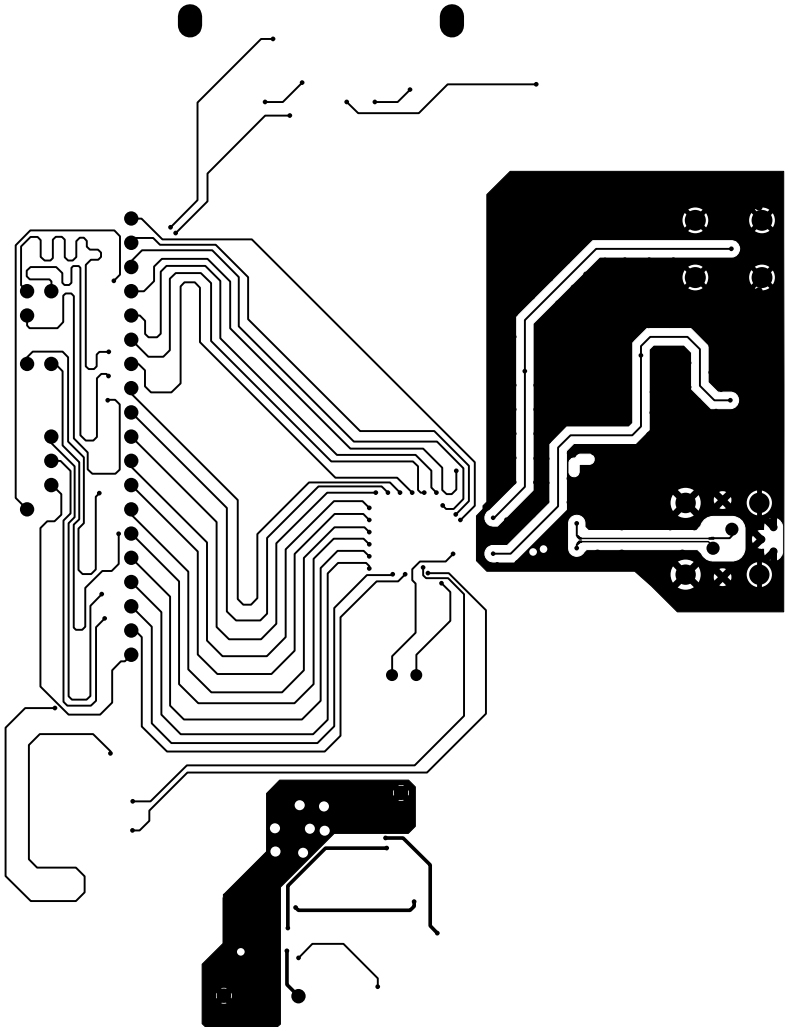
4. Layer 3 - VCC



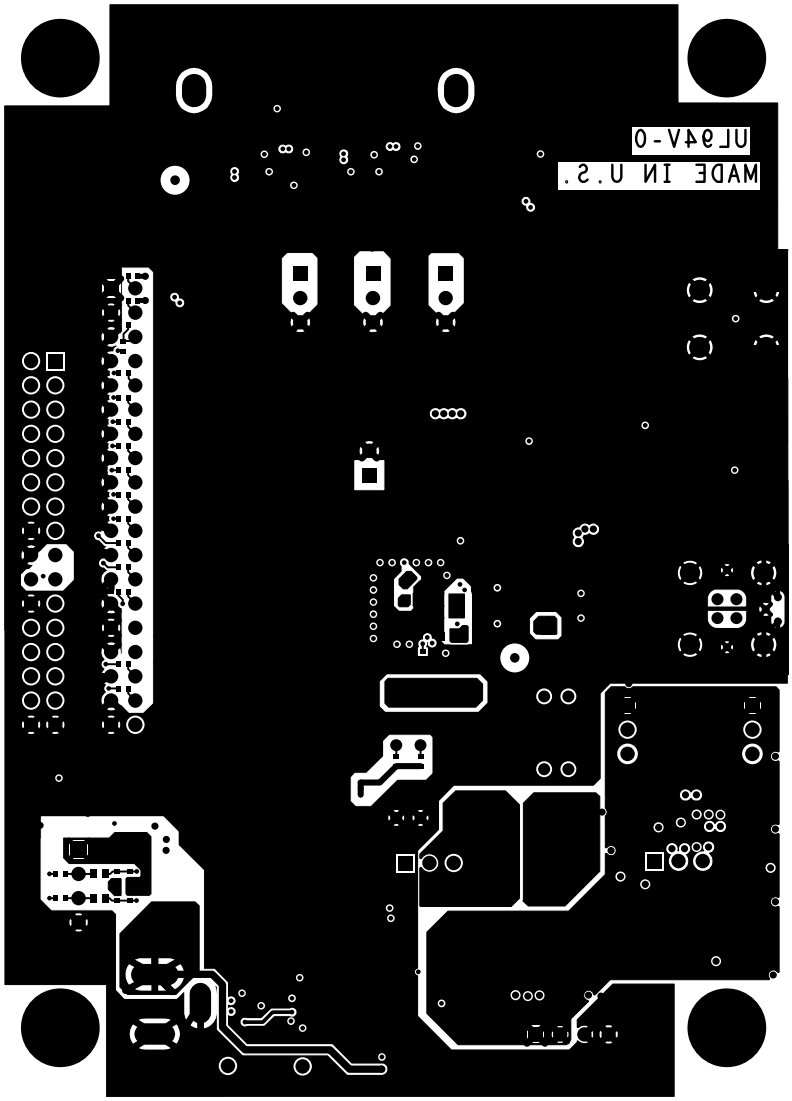
5. Layer 4 - GND-2



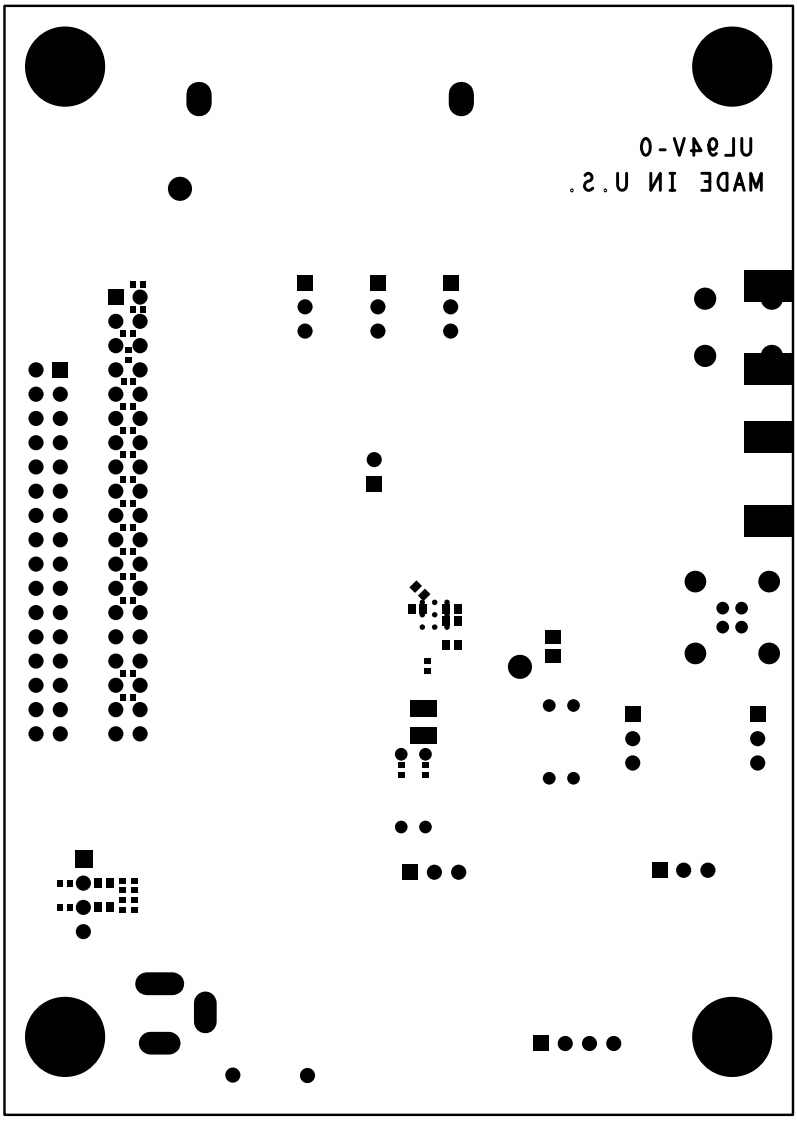
6. Layer 5 - SIGNAL



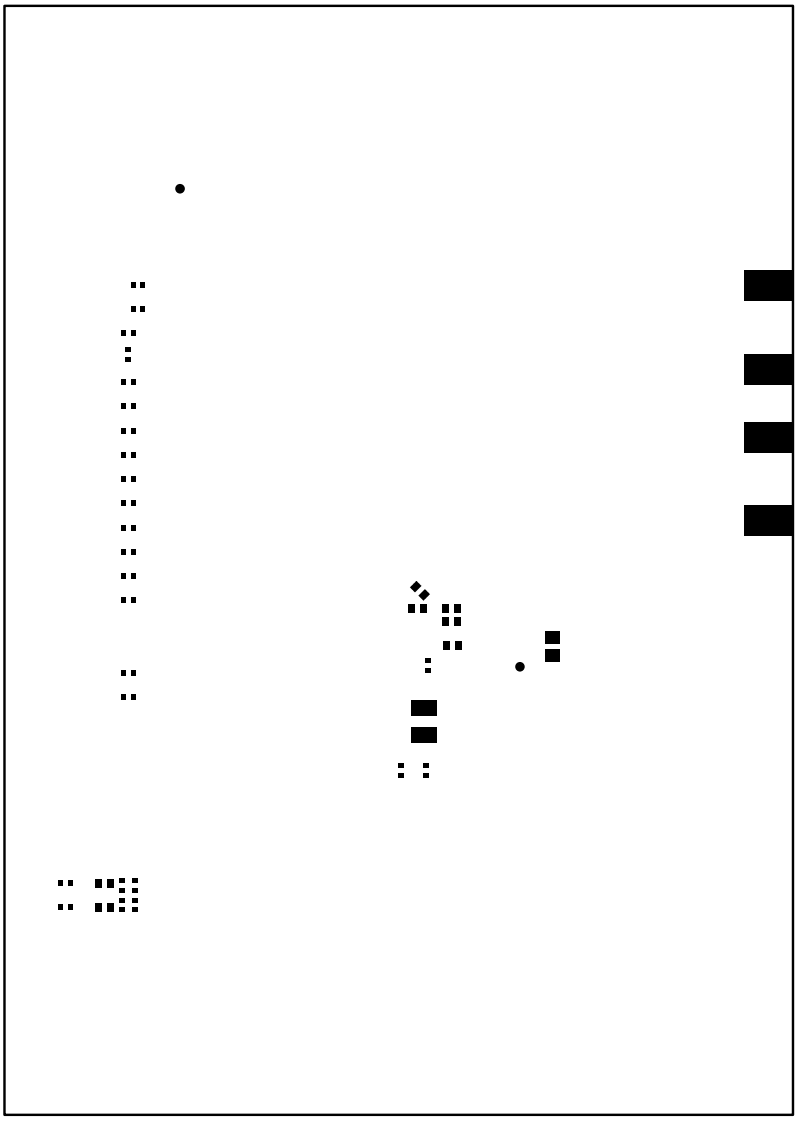
7. Layer 6 - BOTTOM



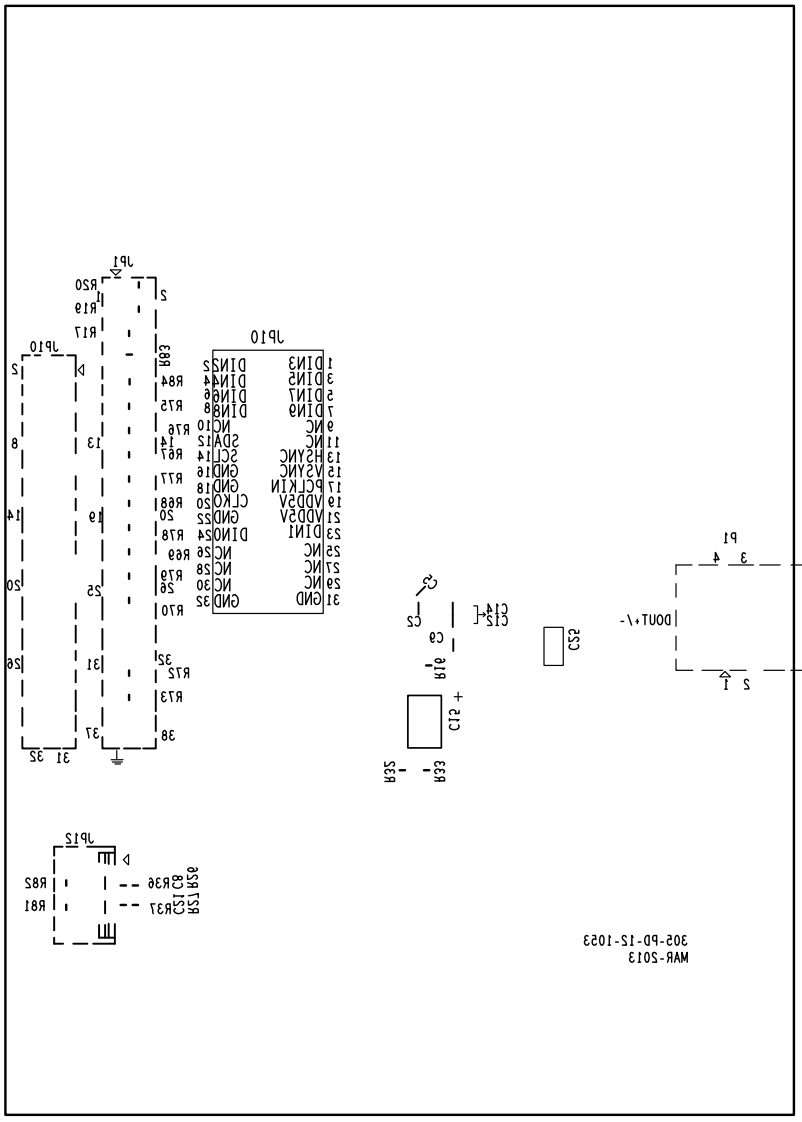
8. BOTTOM MASK



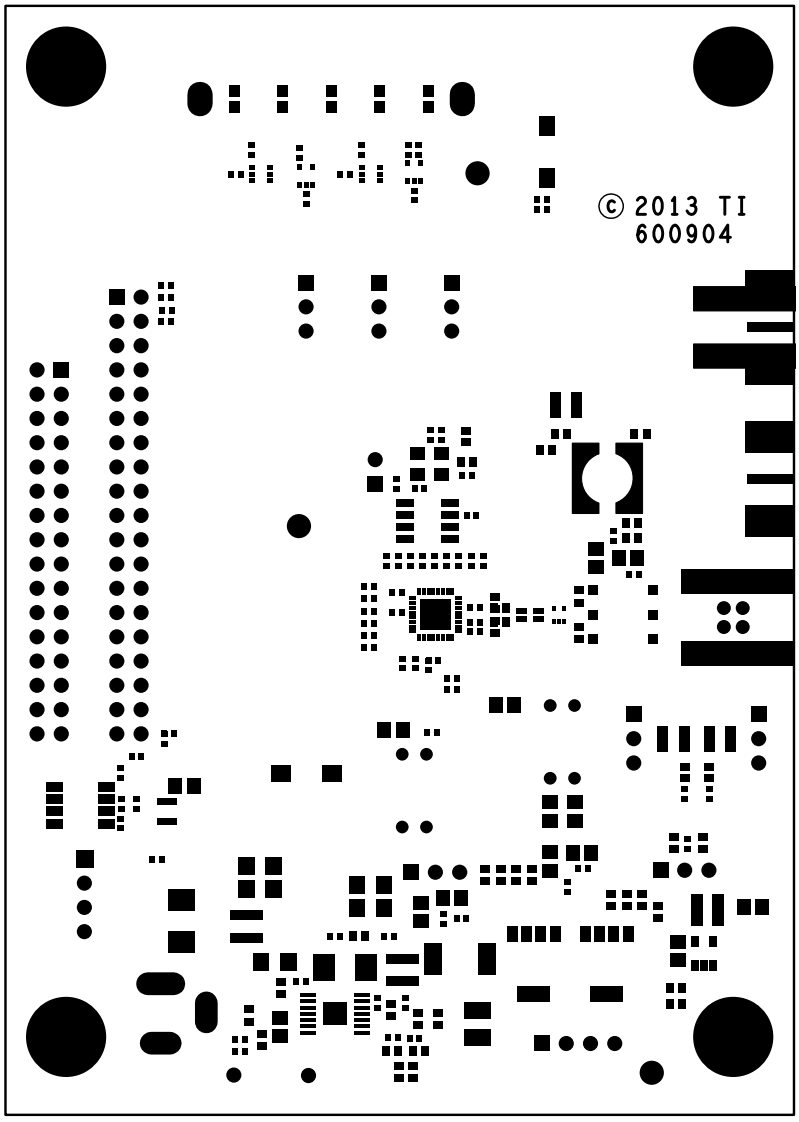
9. BOTTOM PASTE



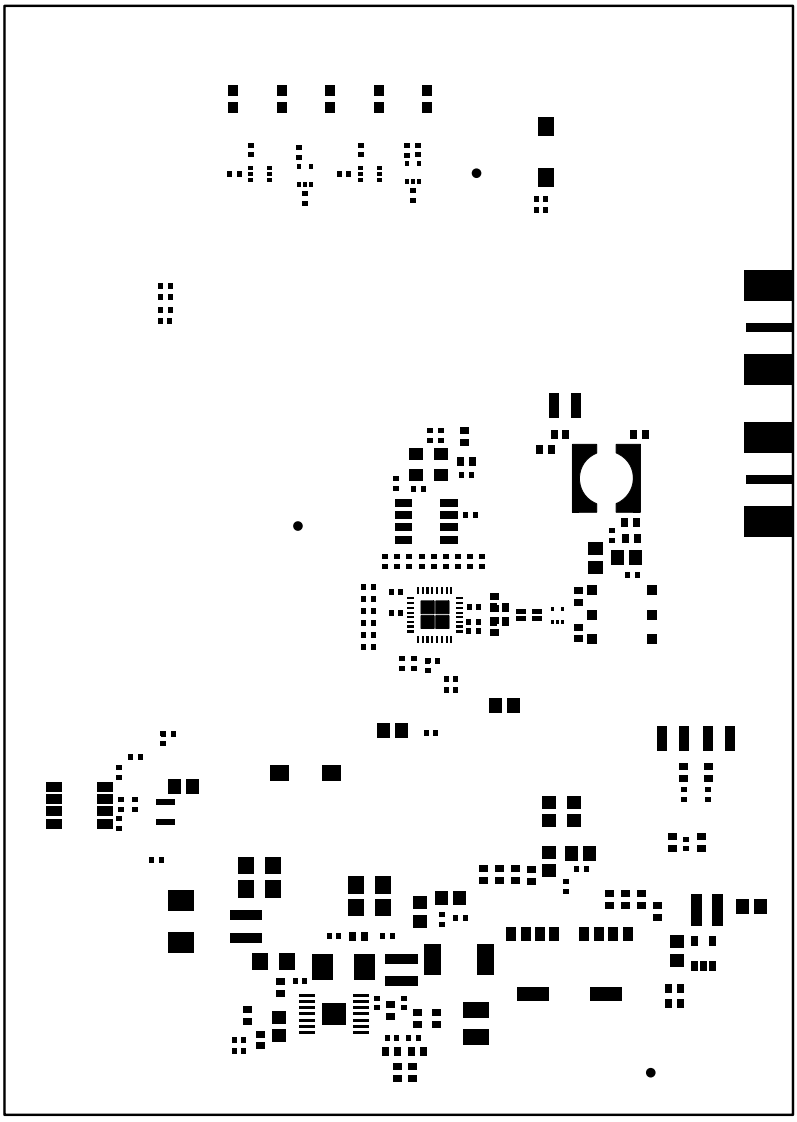
10. BOTTOM SILK



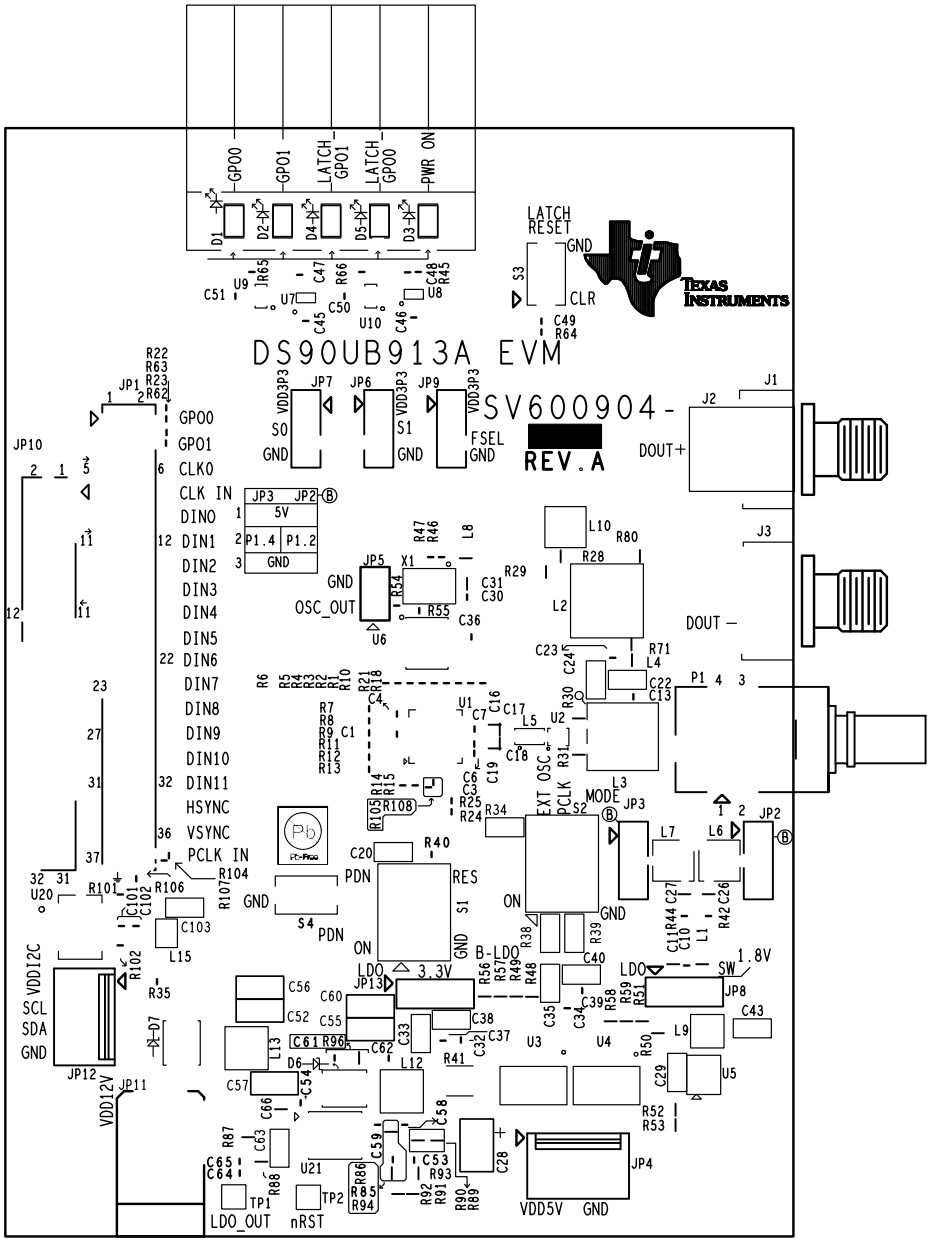
11. TOP MASK



12. TOP PASTE



13. TOP SILK

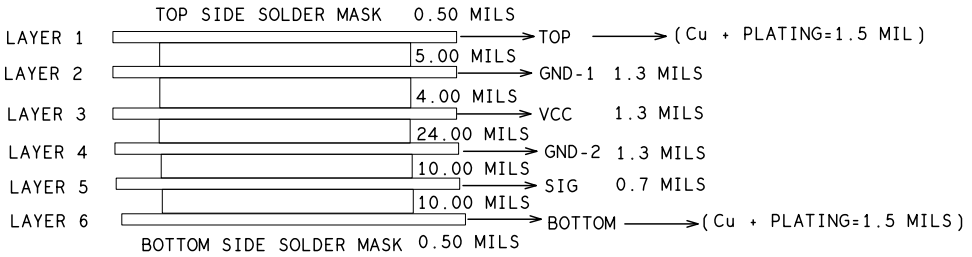


B.2 DS90UB914A-CXEVM Deserializer Board Layout

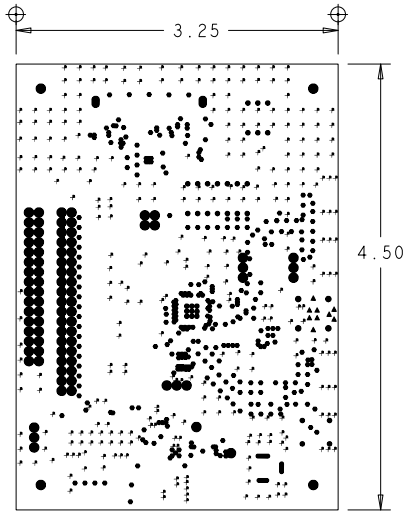
1. DS90UB914A-CXEVM Stackup & FAB Notes

LAYER STACK-UP

THIS IS A 6 LAYER BOARD



DRILL CHART: TOP to BOTTOM				
ALL UNITS ARE IN MILS				
FIGURE	SIZE	TOLERANCE	PLATED	QTY
•	10.0	+3.0/-3.0	PLATED	9
•	10.0	+3.0/-3.0	PLATED	338
*	16.0	+3.0/-3.0	PLATED	316
▲	16.0	+3.0/-3.0	PLATED	5
•	30.0	+3.0/-3.0	PLATED	20
▲	35.0	+3.0/-3.0	PLATED	4
●	40.0	+3.0/-3.0	PLATED	88
•	40.0	+3.0/-3.0	PLATED	2
•	40.0	+3.0/-3.0	PLATED	6
•	62.99	+3.0/-3.0	PLATED	4
•	65.0	+3.0/-3.0	PLATED	4
●	156.0	+2.0/-2.0	NON-PLATED	4
▬	123.11x44.37	+3.0/-3.0	PLATED	1
▮	123.11x44.37	+3.0/-3.0	PLATED	1
▬	142.8x44.37	+3.0/-3.0	PLATED	1
⬮	118.0x79.0	+2.0/-2.0	NON-PLATED	2

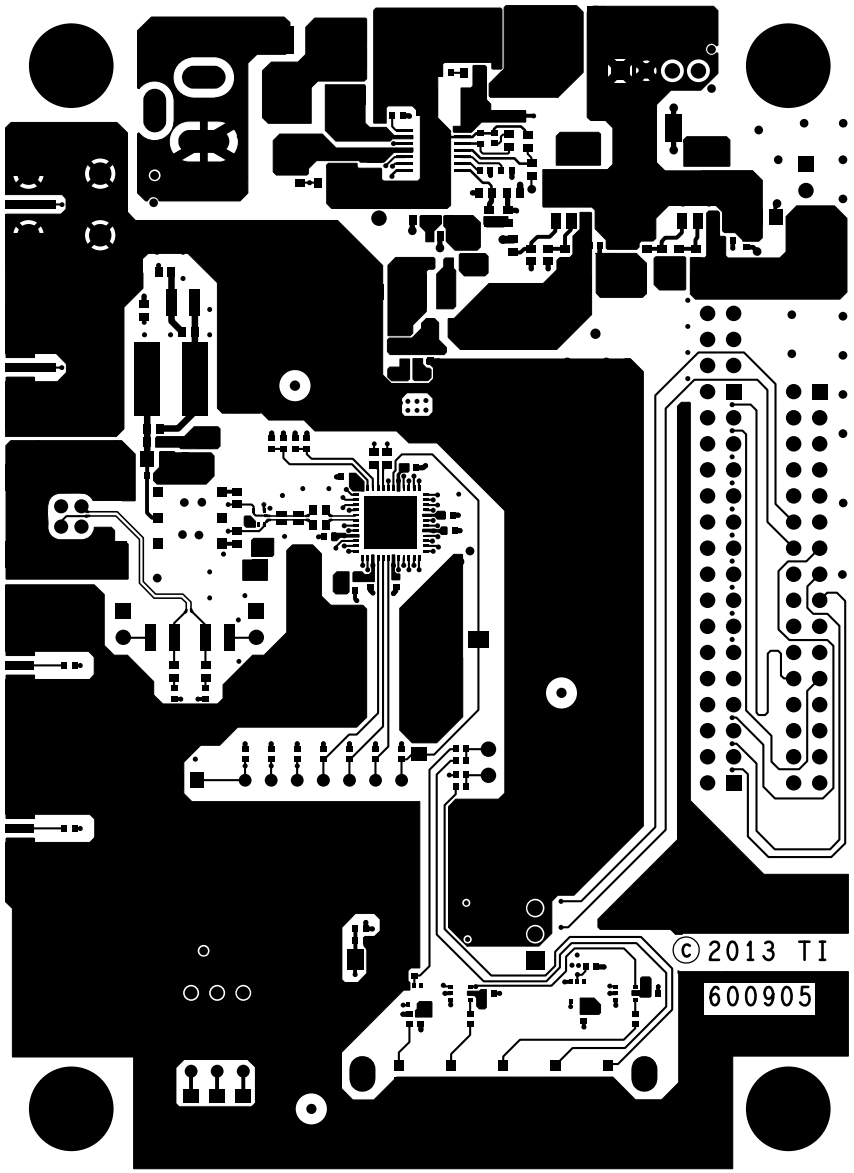


TEXAS INSTRUMENTS		
NAME:DS90UB914 DEMO BRD		
DATE:MAR 2013	DOC NO:SV600905	Rev.3
LAYER: FAB		

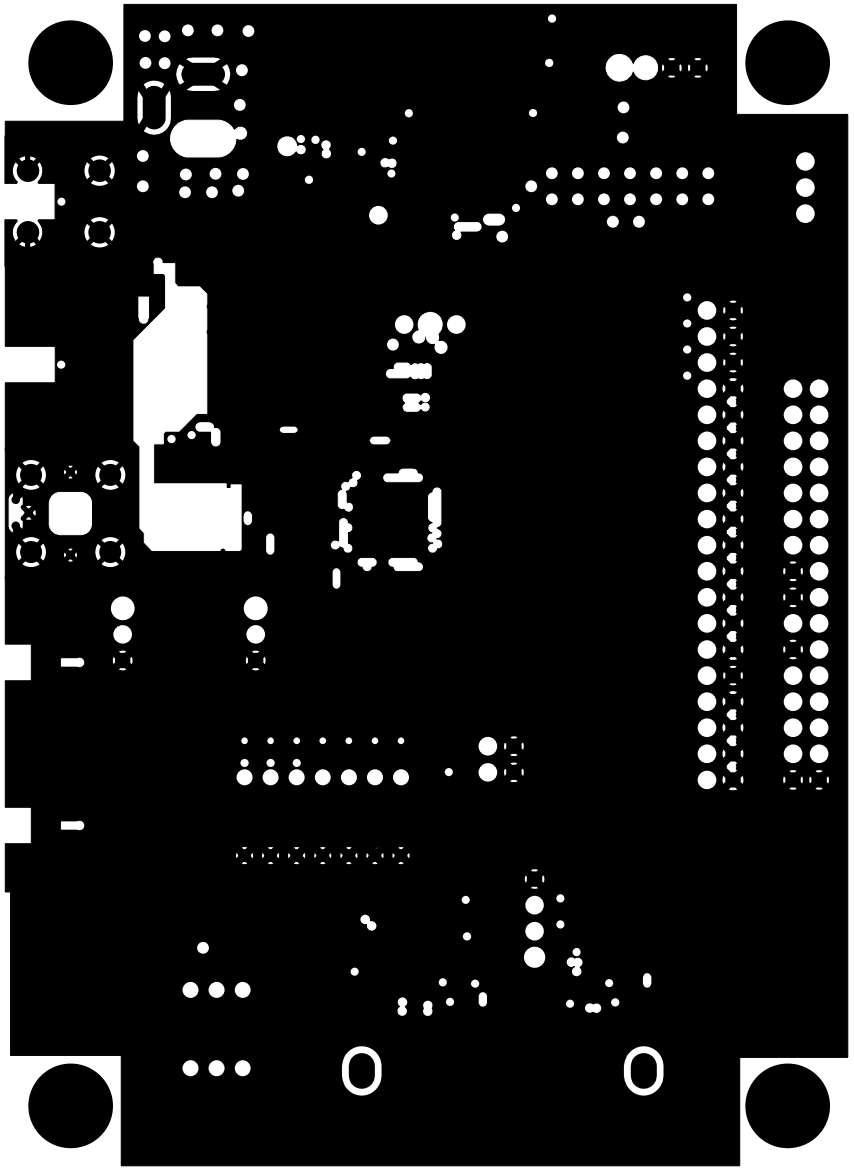
NOTES (UNLESS OTHERWISE SPECIFIED):

1. BOARD THICKNESS : 62 +/- 4 MILS
2. DIELECTRIC : FR4
3. NUMBER OF LAYERS: 6.
4. SOLDERMASK : LPI GREEN.
5. SILKSCREEN : WHITE EPOXY INK.
6. NO VENDOR LOGO OR NAME ON THE BOARD.
7. REMOVE THE NON-FUNCTIONAL PADS ON ALL INNER LAYERS.
8. PLATING : SOFT IMMERSION GOLD.
9. MAXIMUM WARP AND TWIST SHALL NOT EXCEED .005 PER INCH.
10. ANY CHANGES MADE BY THE PCB FABRICATOR TO THE FILM OR THE GERBER FILES MUST BE APPROVED BY TEXAS.
11. DEBURR ALL SHARP EDGES.
12. BOARD DIMENSIONS ARE IN INCHES.
13. 8 MIL TRACES REQUIRES 50 OHM +/-5 OHM SINGLE ENDED IMPEDANCE ON TOP LAYER AND SIGNAL LAYER.
6/9/6 TRACES REQUIRE 100 OHM +/-5 OHM DIFFERENTIAL IMPEDANCE ON TOP LAYER.
6/7/6 TRACES REQUIRE 100 OHM +/-5 OHM DIFFERENTIAL IMPEDANCE ON SIGNAL LAYER(ON LAYER 5).
14. THIS BOARD SHOULD BE LEAD FREE.

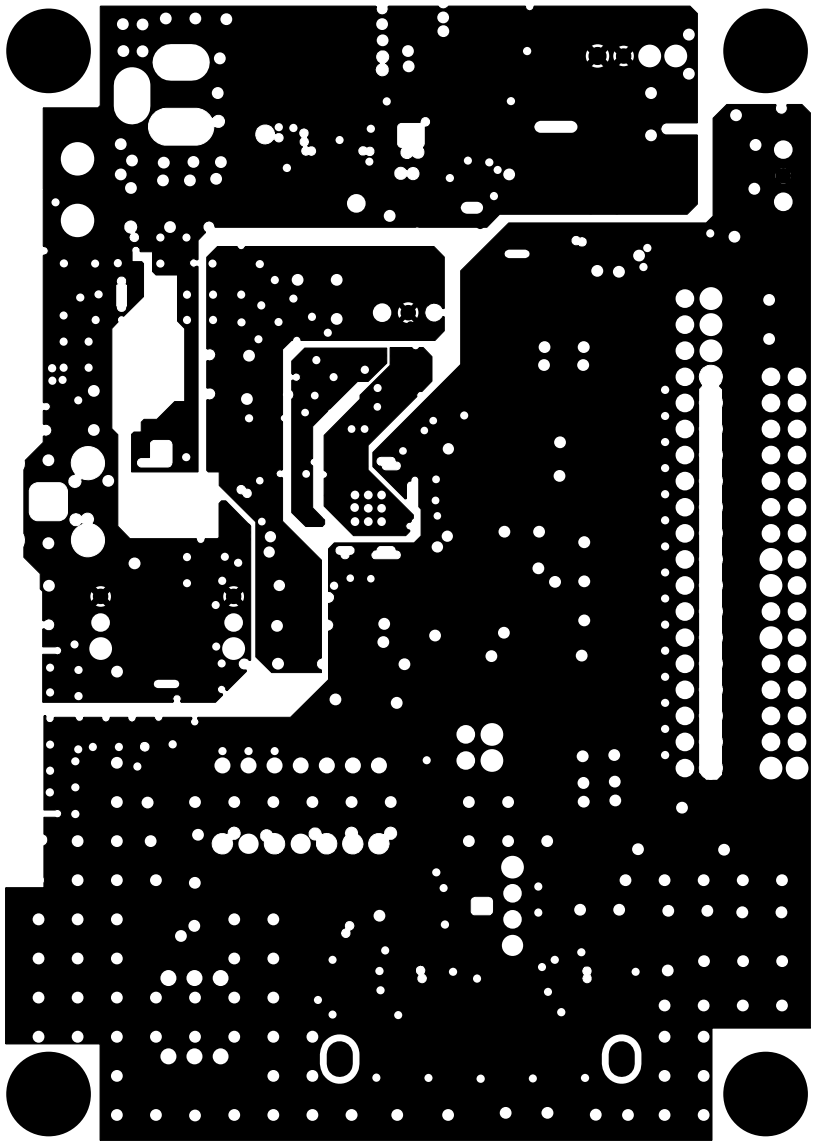
2. Layer 1 - TOP



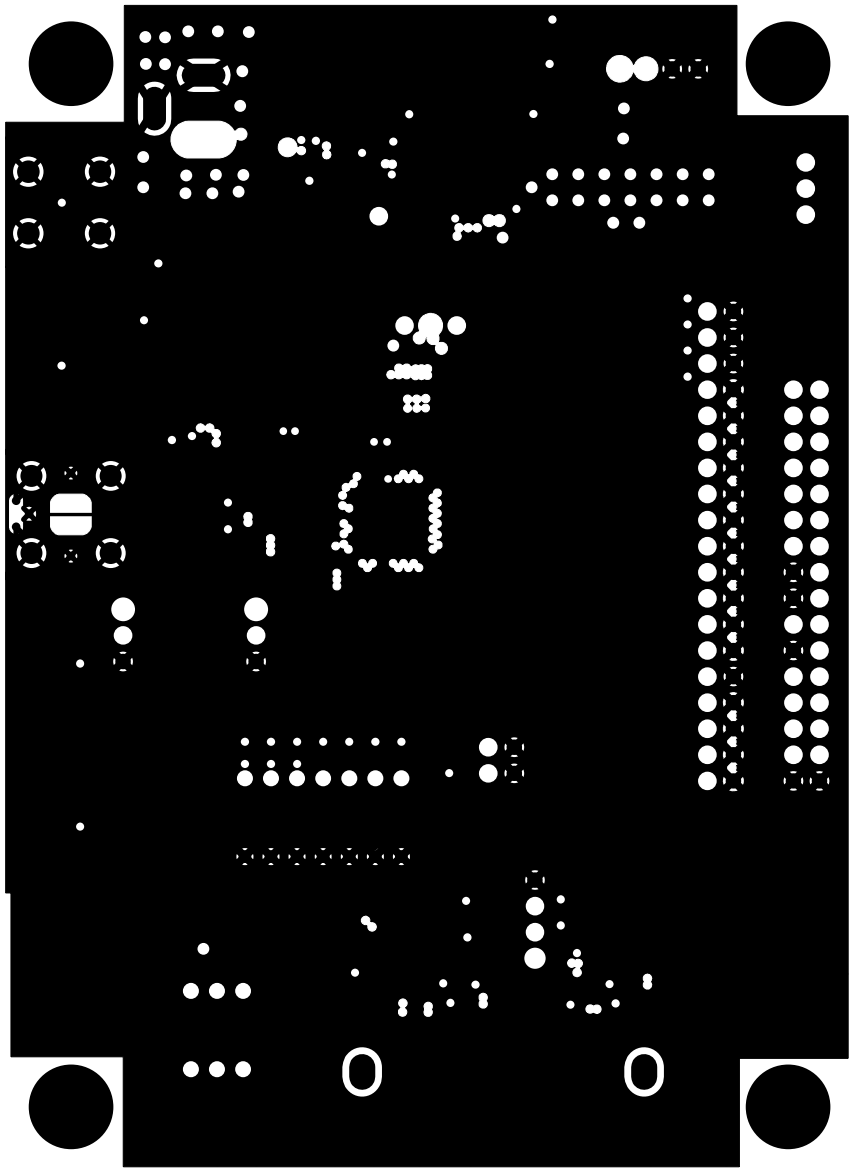
3. Layer 2 - GND-1



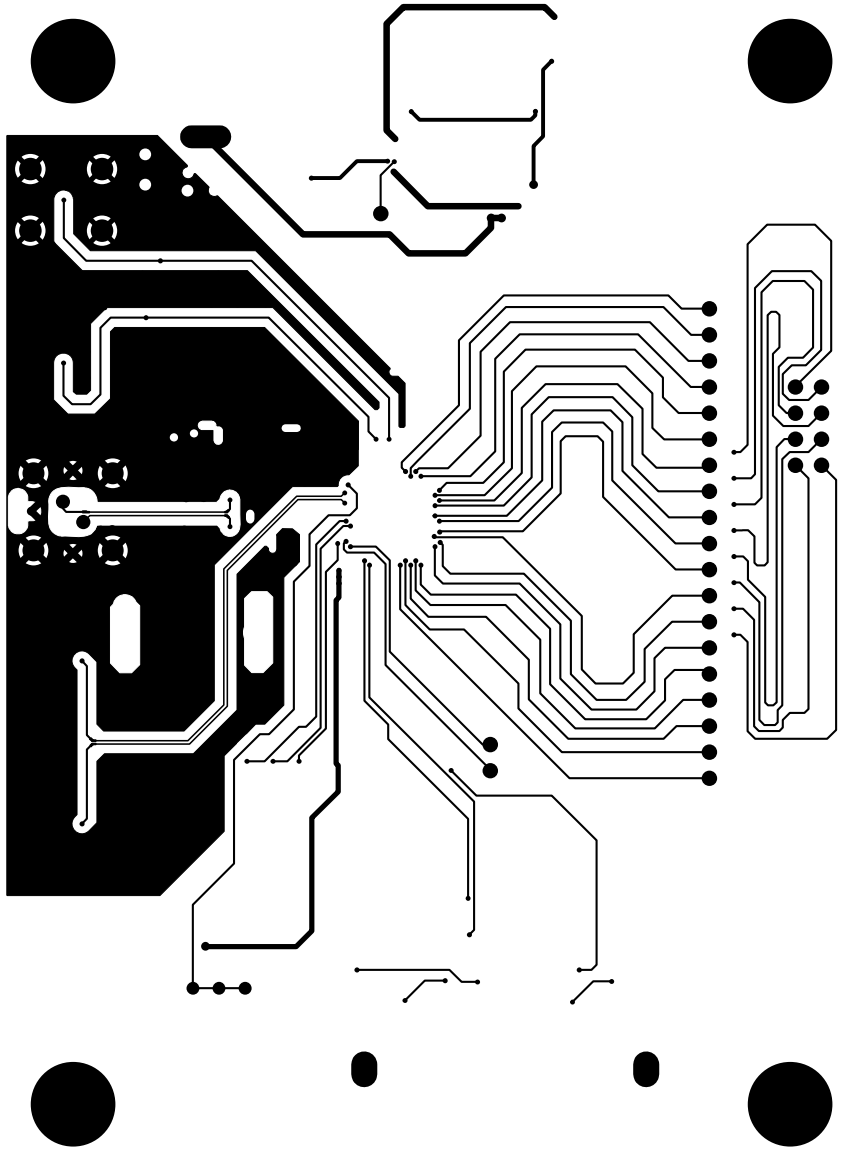
4. Layer 3 - VCC



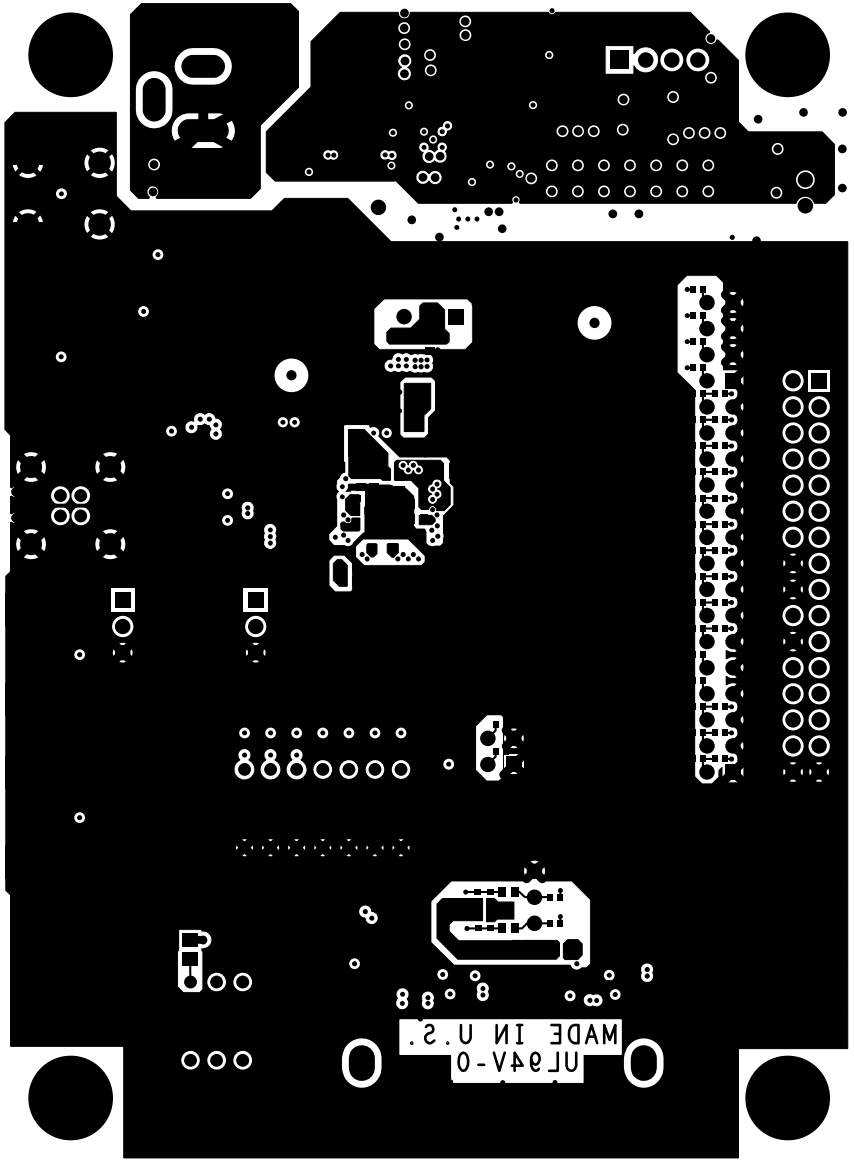
5. Layer 4 - GND-2



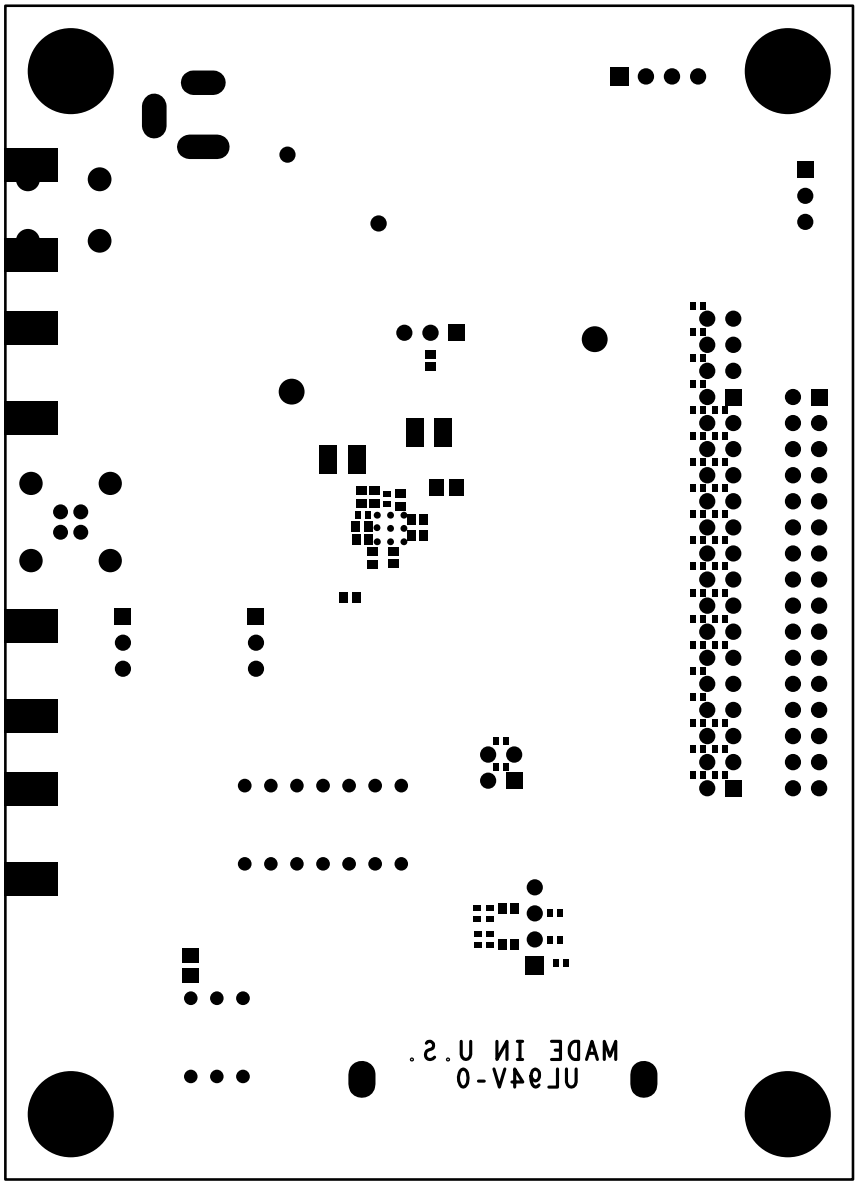
6. Layer 5 - SIGNAL



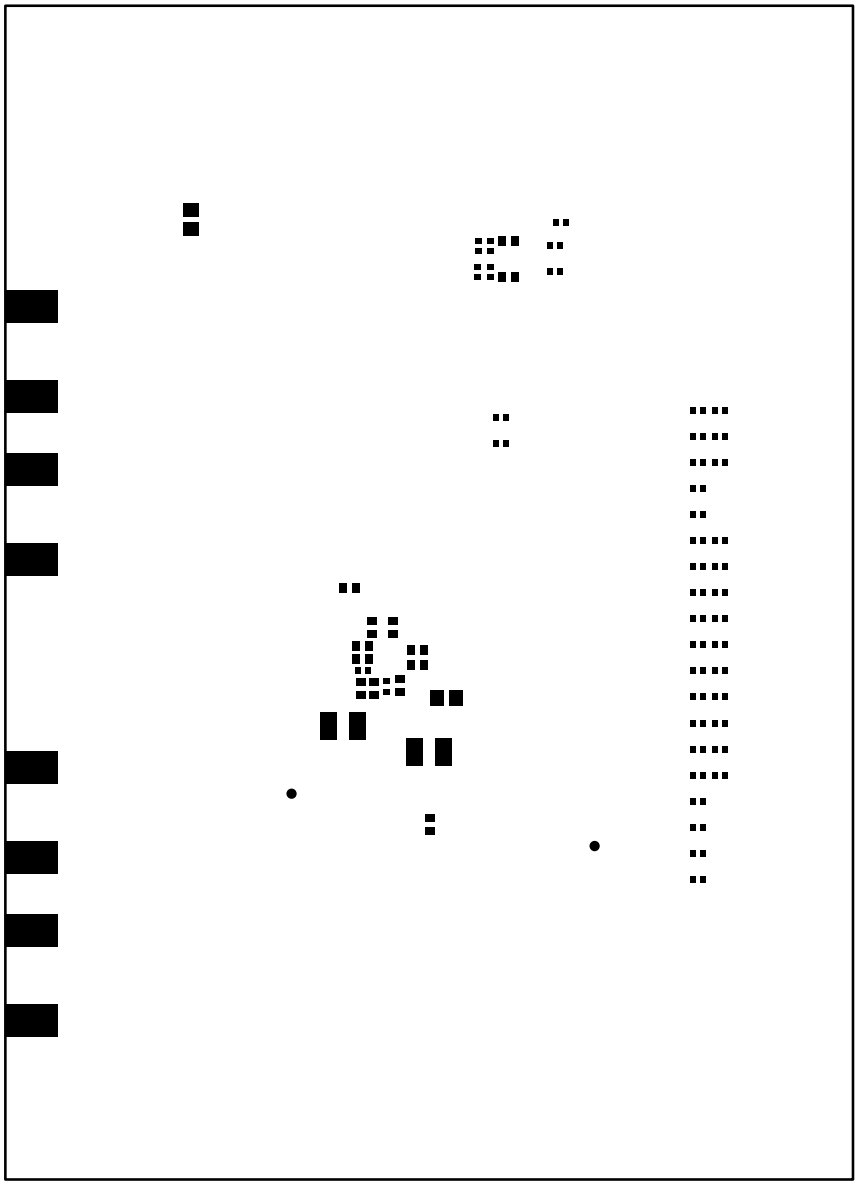
7. Layer 6 - BOTTOM



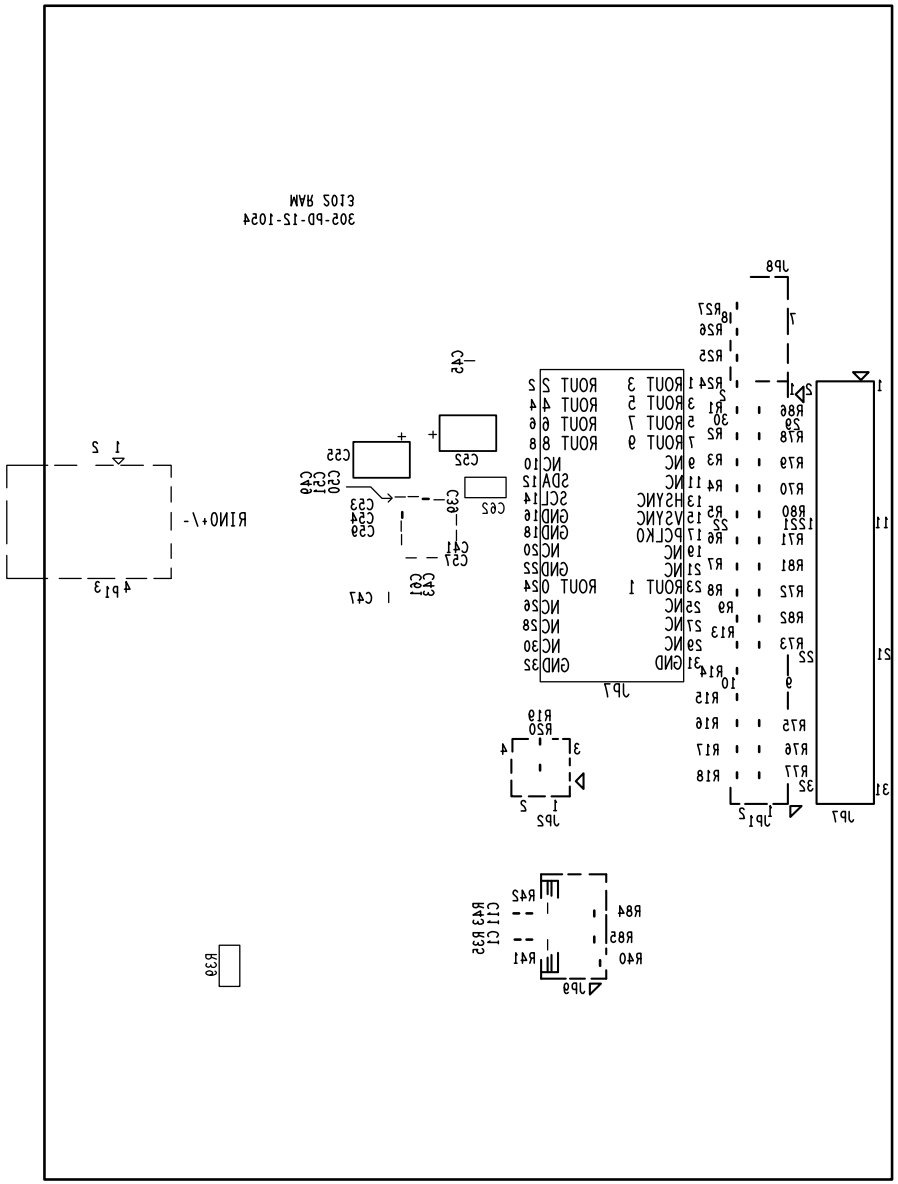
8. BOTTOM MASK



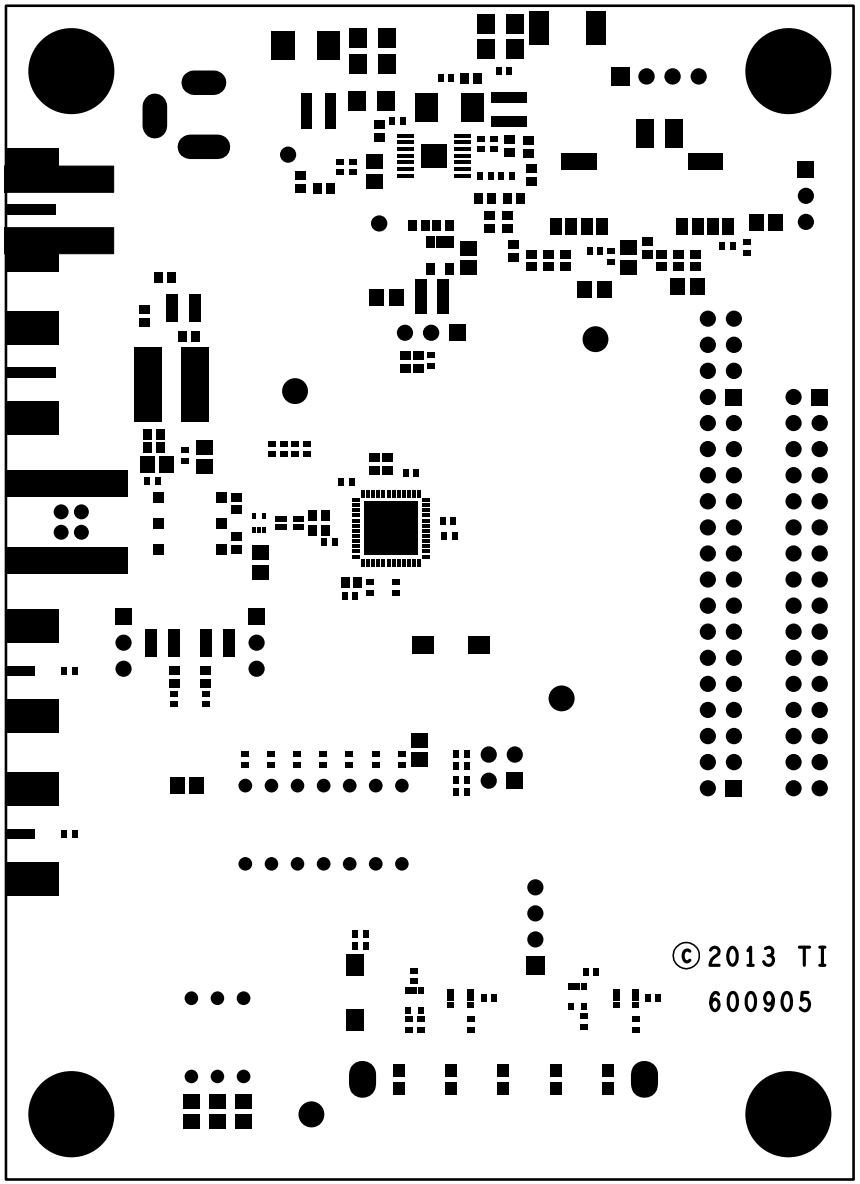
9. BOTTOM PASTE



10. BOTTOM SILK

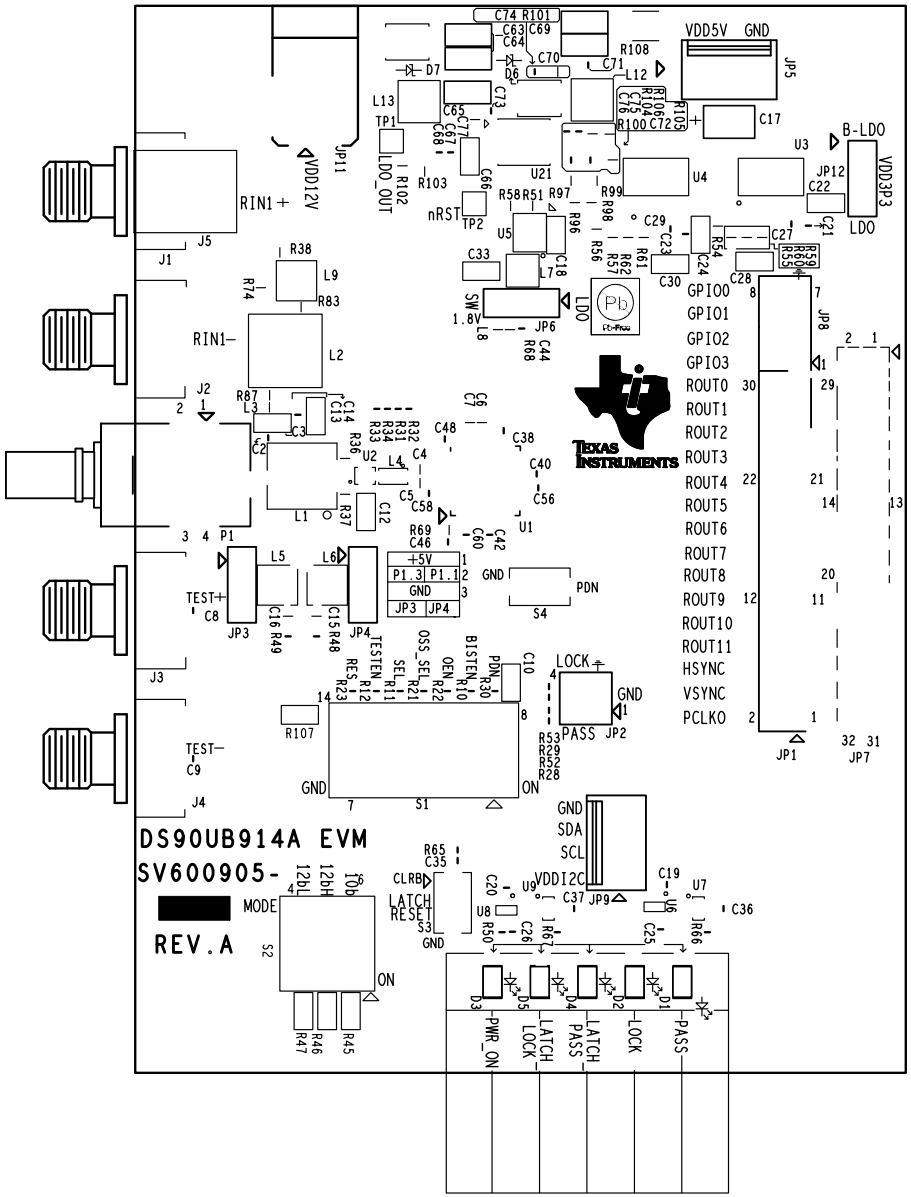


11. TOP MASK



12. TOP PASTE

13. TOP SILK



Bill of Materials

C.1 DS90UB913A-CXEVM Serializer Board BOM

Table C-1. DS90UB913A-CXEVM BOM

Qty.	Reference	Part	PCB Footprint	MFR and Part#
23	C1, C3, C4, C6, C7, C10, C13, C23, C26, C27, C30, C32, C34, C36, C37, C39, C47, C48, C49, C50, C51, C54, C101	0.1µF	0402	MuRata GRM155R71C104KA88D CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R
7	C2, C5, C9, C11, C12, C14, C31	1µF	0603	MuRata GRM188R71E105KA12D CAP, CERM, 1 µF, 25 V, +/- 10%, X7R
2	C15, C28	22µF	1210	MuRata GCM32ER71C226KE19L CAP, CERM, 22 µF, 16 V, +/- 10%, X7R
2	C16, C66	0.1µF	0603	MuRata GRM188R72A104KA35D CAP, CERM, 0.1 µF, 100 V, +/- 10%, X7R
1	C19	0.047µF	0603	MuRata GRM188R71H473KA61D CAP, CERM, 0.047 µF, 50 V, +/- 10%, X7R
6	C20, C25, C29, C38, C40, C43	10µF	0805	MuRata GRM21BR61C106KE15L CAP, CERM, 10 µF, 16 V, +/- 10%, X5R
4	C22, C24, C33, C35	4.7µF	0805	MuRata GRM21BR71C475KA73L CAP, CERM, 4.7 µF, 16 V, +/- 10%, X7R
2	C45, C46	10pF	0402	MuRata GRM1555C1H100JA01D CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0
1	C52	4.7µF	1206_190	TDK C3216X7R1H475M160AC CAP, CERM, 4.7 µF, 50 V, +/- 20%, X7R
1	C53	0.082µF	0402	Kemet C0402C823K4RACTU CAP, CERM, 0.082 µF, 10 V, +/- 10%, X7R
2	C56, C57	22µF	1206_190	TDK C3216X5R1E226M160AB CAP, CERM, 22 µF, 25 V, +/- 20%, X5R, 1206
1	C58	3900pF	0402	Kemet C0402C392K4RACTU CAP, CERM, 3900 pF, 16 V, +/- 10%, X7R
1	C63	10µF	0805	TDK C2012X7R1A106K125AC CAP, CERM, 10 µF, 10 V, +/- 10%, X7R
1	C102	0.01µF	0402	MuRata GRM155R71C103KA01D CAP, CERM, 0.01 µF, 16 V, +/- 10%, X7R
1	C103	10µF	0805	MuRata GRM21BR71A106KE51L CAP, CERM, 10 µF, 10 V, +/- 10%, X7R
1	D1	LED	SMD	Lite-On LTST-C191TGKT LED, Green, SMD
2	D2, D5	LED	SMD	Lite-On LTST-C191KFKT LED, Orange, SMD
2	D3, D4	LED	SMD	Lite-On LTST-C191KRKT LED, Red, SMD
2	D6, D7	Schottky	SMB	ON Semiconductor MBRS1540T3G Diode, Schottky, 40 V, 1.5 A, SMB
1	J2	RF 50 Ohm		Rosenberger 59S2AQ-40MT5-Z Connector. RF 50 Ohm R/A, TH
1	JP1	Header		Samtec TSW-119-07-T-D Header, 2.54mm, 19x2, Tin, TH
7	JP2, JP3, JP6, JP7, JP8, JP9, JP13	Header		Samtec TSW-103-07-T-S Header, 2.54 mm, 3x1, Tin, TH

Table C-1. DS90UB913A-CXEVM BOM (continued)

Qty.	Reference	Part	PCB Footprint	MFR and Part#
1	JP4	Header		Molex 0022112042 Header (friction lock), 100mil, 4x1, Gold, TH
1	JP5	Header		Samtec TSW-102-07-T-S Header, 2.54 mm, 2x1, Tin, TH
1	JP11	Power Jack		Switchcraft RAPC722X Power Jack, mini, 2.1mm OD, R/A, TH
1	JP12	Header		Samtec TSW-104-07-G-S Header, 100mil, 4x1, Gold, TH
4	L1, L4, L8, R29/L16	1000Ω @ 100 MHz	0603	MuRata BLM18AG102SN1D Ferrite Bead, 1000 ohm @ 100 MHz, 0.4 A
1	L2	100µH	SMD	Coilcraft MSS7341T-104MLB Inductor, Shielded Drum Core, Ferrite, 100 µH, 0.7 A, 0.28 ohm, SMD
1	L9	2.2µH	SMD	Coilcraft LPS3015-222MLB Inductor, Shielded Drum Core, Ferrite, 2.2 µH, 1.4 A, 0.11 ohm, SMD
1	L10	4.7µH	SMD	Coilcraft 1008PS-472KLB Inductor, Shielded, Ferrite, 4.7 µH, 0.7 A, 0.35 ohm, SMD
2	L12, L13	4.7µH	SMD	Coilcraft XFL4020-472MEB Inductor, Shielded, Composite, 4.7 µH, 2.7 A, 0.05 ohm, SMD
1	L15	2.2µH	SMD	Taiyo Yuden BRL2518T2R2M Inductor, Wirewound, 2.2 µH, 0.85 A, 0.135 ohm, SMD
25	R1, R2, R3, R4, R5, R6, R7, R8, R9, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R24, R32, R33, R34, R46, R64	10kΩ	0402	Panasonic ERJ-2GEJ103X RES, 10 k, 5%, 0.1 W
8	R10, R25, R35, R40, R54, R55, R104, R105	0Ω	0402	Panasonic ERJ-2GE0R00X RES, 0, 5%, 0.063 W
5	R22, R23, R45, R65, R66	330Ω	0402	Panasonic ERJ-2RKF3300X RES, 330, 1%, 0.1 W
2	R26, R27	4.7kΩ	0402	Panasonic ERJ-2RKF4701X RES, 4.70 k, 1%, 0.1 W
2	R28, R71	1kΩ	0603	Panasonic ERJ-3EKF1001V RES, 1.00 k, 1%, 0.1 W
2	R36, R37	0Ω	0603	Panasonic ERJ-3GEY0R00V RES, 0, 5%, 0.1 W
1	R38	100kΩ	0805	Panasonic ERJ-6ENF1003V RES, 100 k, 1%, 0.125 W
1	R39	4.7kΩ	0805	Panasonic ERJ-6GEYJ472V RES, 4.7 k, 5%, 0.125 W
1	R41	0Ω	2512	Vishay-Dale CRCW25120000Z0EGHP RES, 0, 5%, 1.5 W, AEC-Q200 Grade 0
2	R42, R44	49.9Ω	0402	Panasonic ERJ-2RKF49R9X RES, 49.9, 1%, 0.1 W
7	R48, R50, R52, R57, R59, R91, R92	10kΩ	0603	Panasonic ERJ-3EKF1002V RES, 10.0 k, 1%, 0.1 W
1	R56	16.5kΩ	0603	Panasonic ERJ-3EKF1652V RES, 16.5 k, 1%, 0.1 W
1	R58	4.53kΩ	0603	Panasonic ERJ-3EKF4531V RES, 4.53 k, 1%, 0.1 W
2	R62, R63	100Ω	0402	Panasonic ERJ-2RKF1000X RES, 100, 1%, 0.1 W
1	R80	49.9Ω	0603	Panasonic ERJ-3EKF49R9V RES, 49.9, 1%, 0.1 W
1	R85	53kΩ	0603	Vishay-Dale PAT0603E5302BST1 RES, 53.0 k, 0.1%, 0.15 W
2	R86, R88	20kΩ	0603	Panasonic ERJ-3EKF2002V RES, 20.0 k, 1%, 0.1 W
1	R87	34kΩ	0603	Panasonic ERJ-3EKF3402V RES, 34.0 k, 1%, 0.1 W
1	R89	30kΩ	0603	Panasonic ERJ-3EKF3002V RES, 30.0 k, 1%, 0.1 W
1	R90	5.69kΩ	0603	Vishay-Dale PAT0603E5691BST1 RES, 5.69 k, 0.1%, 0.15 W
1	R101	22Ω	0402	Panasonic ERJ-2GEJ220X RES, 22, 5%, 0.1 W
2	S1, S2	Switch		Grayhill 78B02ST Switch, 2 SPST, 0.15 A, 30 V, TH
2	S3, S4	Switch	SMD	Panasonic EVQPNF04M Switch, Tactile, SPST-NO, 0.05A, 12V, SMD
1	U1	IC	RTV0032A	Texas Instruments DS90UB913ATRTVTQ1 DS90UB913A-Q1/DS90UB914A-Q1 25 to 100 MHz 10/20-Bit FPD-Link III Serializer and Deserializer

Table C-1. DS90UB913A-CXEVM BOM (continued)

Qty.	Reference	Part	PCB Footprint	MFR and Part#
2	U3, U4	LDO	SOT-223	Texas Instruments LP38693MP-ADJ/NOPB 500mA Low Dropout CMOS Linear Regulators with Adjustable Output Stable with Ceramic Output Capacitors, Pb-Free
1	U5	Switcher	SOT-23	Texas Instruments LM3671MF-1.8/NOPB 2MHz, 600mA Step-Down DC-DC Converter, Pb-Free
2	U7, U8	Inverter	SOT-353	Fairchild Semiconductor NC7SP04P5X TinyLogic ULP Inverter
2	U9, U10	Flip-Flop	SOT-363	Fairchild Semiconductor NC7SZ175P6X TinyLogic UHS D-Type Flip-Flop with Asynchronous Clear
1	U20	Freq. Multiplier	SOIC-8	Cypress Semiconductor CY2302SXI-1 Frequency Multiplier and Zero Delay Buffer
1	X1	48MHz	SMD	ECS Inc. ECS-3963-480-BN-TR OSC, 48 MHz, 3.3 V, SMD
0	C8, C21	5pF	0402	MuRata GRM1555C1H5R0CA01D CAP, CERM, 5 pF, 50 V, +/- 5%, C0G/NP0
0	C17, C18	0.1µF	0603	MuRata GRM188R72A104KA35D CAP, CERM, 0.1 µF, 100 V, +/- 10%, X7R
0	C55, C60	22µF	1206_190	TDK C3216X5R1E226M160AB CAP, CERM, 22 µF, 25 V, +/- 20%, X5R
0	C59	12pF	0402	Kemet C0402C120J3GACAUTO CAP, CERM, 12 pF, 25 V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1
0	C61, C62, C64, C65	0.1µF	0402	MuRata GRM155R71C104KA88D CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R
0	J1, J3	RF 50 Ohm		Emerson Network Power 142-0701-871 RF 50 Ohm Gold Connectors / Coaxial Connectors PC END
0	JP10	Header		Samtec TSW-116-07-G-D Header, 100mil, 16x2, Gold, TH
0	L3	165µH	SMD	Coilcraft KA4909-AL Inductor, Wirewound, Ferrite, 165 µH, 0.65 A, 0.46 ohm, SMD
0	L5	Common-Mode Choke	SMD	MuRata DLW21SN261XQ2L Coupled inductor, 0.22 A, 0.59 ohm, SMD
0	L6, L7	10µH	SMD	Coilcraft 1008PS-103KLB Inductor, Shielded, Ferrite, 10 µH, 0.4 A, 0.92 ohm, SMD
0	P1	RF 50 Ohm		Rosenberger D4S20L-40MA5-Z Right Angle Plug for PCB, TH
0	R21, R47, R67, R68, R69, R70, R72, R73, R75, R76, R77, R78, R79, R81, R82, R83, R84, R106, R107, R108	0Ω	0402	Panasonic ERJ-2GE0R00X RES, 0, 5%, 0.063 W
0	R30, R31, R49, R51, R53, R93, R94	0Ω	0603	Panasonic ERJ-3GEY0R00V RES, 0, 5%, 0.1 W
0	R96	1kΩ	0603	Vishay-Dale CRCW06031K00FKEA RES, 1.00 k, 1%, 0.1 W
0	R102	22Ω	0402	Panasonic ERJ-2GEJ220X RES, 22, 5%, 0.1 W
0	U2	ESD	SOT (DRL)	Texas Instruments TPD2E001DRLR Low-Capacitance + / - 15 kV ESD-Protection Array for High-Speed Data Interfaces, 2 Channels, -40 to +85 degC, Green (RoHS & no Sb/Br)
0	U6	SSCG	SOIC-8	ON Semiconductor P3P25814AG-08SR Spread Spectrum Clock Generator
0	U21	Switcher	PWP0014E	Texas Instruments TPS65320QPWPRQ1 40-V Step-Down Converter With Eco-mode and LDO Regulator

C.2 DS90UB914A-CXEVM Deserializer Board BOM

Table C-2. DS90UB914A-CXEVM BOM

Qty.	Reference	Part	PCB Footprint	MFR and Part#
25	C2, C8, C9, C13, C21, C23, C25, C26, C27, C29, C35, C36, C37, C38, C40, C42, C44, C46, C48, C50, C53, C56, C58, C60, C73	0.1µF	0402	MuRata GRM155R71C104KA88D CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R
4	C3, C14, C22, C24	4.7µF	0805	MuRata GRM21BR71C475KA73L CAP, CERM, 4.7 µF, 16 V, +/- 10%, X7R
3	C6, C15, C16	0.1µF	0603	MuRata GRM188R72A104KA35D CAP, CERM, 0.1 µF, 100 V, +/- 10%, X7R
1	C7	0.047µF	0603	MuRata GRM188R71H473KA61D CAP, CERM, 0.047 µF, 50 V, +/- 10%, X7R
6	C10, C18, C28, C30, C33, C62	10µF	0805	MuRata GRM21BR71A106KE51L CAP, CERM, 10 µF, 10 V, +/- 10%, X7R
1	C12	10µF	0805	MuRata GRM21BR61C106KE15L CAP, CERM, 10 µF, 16 V, +/- 10%, X5R
3	C17, C52, C55	22µF	1210	MuRata GCM32ER71C226KE19L CAP, CERM, 22 µF, 16 V, +/- 10%, X7R
11	C39, C41, C43, C45, C47, C49, C51, C54, C57, C59, C61	1µF	0603	MuRata GRM188R71E105KA12D CAP, CERM, 1 µF, 25 V, +/- 10%, X7R
1	C63	4.7µF	1206_190	TDK C3216X7R1H475M160AC CAP, CERM, 4.7 µF, 50 V, +/- 20%, X7R
2	C64, C65	22µF	1206_190	TDK C3216X5R1E226M160AB CAP, CERM, 22 µF, 25 V, +/- 20%, X5R
1	C66	10µF	0805	TDK C2012X7R1A106K125AC CAP, CERM, 10 µF, 10 V, +/- 10%, X7R
1	C72	.082µF	0402	Kemet C0402C823K4RACTU CAP, CERM, 0.082 µF, 10 V, +/- 10%, X7R
1	C75	3900pF	0402	Kemet C0402C392K4RACTU CAP, CERM, 3900 pF, 16 V, +/- 10%, X7R
1	C77	0.1µF	0603	TDK C1608X7R1H104K080AA CAP, CERM, 0.1 µF, 50 V, +/- 10%, X7R
1	D1	LED	SMD	Lite-On LTST-C191TGKT LED, Green, SMD
2	D2, D5	LED	SMD	Lite-On LTST-C191KFKT LED, Orange, SMD
2	D3, D4	LED	SMD	Lite-On LTST-C191KRKT LED, Red, SMD
2	D6, D7	Schottky	SMB	ON Semiconductor MBRS1540T3G Diode, Schottky, 40 V, 1.5 A, SMB
1	J5	RF 50 Ohm		Rosenberger 59S2AQ-40MT5-Z Connector. RF 50 Ohm R/A, TH
1	JP1	Header		Samtec TSW-115-08-L-D Header, 100mil, 15x2, Gold, TH
1	JP2	Header		Samtec TSW-102-07-G-D Header, 100mil, 2x2, Gold, TH
4	JP3, JP4, JP6, JP12	Header		Samtec TSW-103-07-G-S Header, 100mil, 3x1, Gold, TH
2	JP5, JP9	Header		Molex 0022112042 Header (friction lock), 100mil, 4x1, Gold, TH
1	JP8	Header		Samtec TSW-104-07-G-D Header, 100mil, 4x2, Gold, TH
1	JP11	Power Jack		Switchcraft RAPC722X Power Jack, mini, 2.1mm OD, R/A, TH
1	L2	100µH	SMD	Coilcraft MSS7341T-104MLB Inductor, Shielded Drum Core, Ferrite, 100 µH, 0.7 A, 0.28 ohm, SMD
3	L3, L8, R38/L14	1000Ω @ 100 MHz	0603	MuRata BLM18AG102SN1D Ferrite Bead, 1000 ohm @ 100 MHz, 0.4 A
1	L7	2.2µH	SMD	Coilcraft LPS3015-222MLB Inductor, Shielded Drum Core, Ferrite, 2.2 µH, 1.4 A, 0.11 ohm, SMD

Table C-2. DS90UB914A-CXEVM BOM (continued)

Qty.	Reference	Part	PCB Footprint	MFR and Part#
1	L9	4.7µH	SMD	Coilcraft 1008PS-472KLB Inductor, Shielded, Ferrite, 4.7 µH, 0.7 A, 0.35 ohm, SMD
2	L12, L13	4.7µH	SMD	Coilcraft XFL4020-472MEB Inductor, Shielded, Composite, 4.7 µH, 2.7 A, 0.05 ohm, SMD
31	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R30, R31, R34, R65	10kΩ	0402	Panasonic ERJ-2GEJ103X RES, 10 k, 5%, 0.1 W
5	R28, R29, R50, R66, R67	330Ω	0402	Panasonic ERJ-2RKF3300X RES, 330, 1%, 0.1 W
3	R32, R33, R40	0Ω	0402	Panasonic ERJ-2GE0R00X RES, 0, 5%, 0.063 W
2	R35, R43	4.7kΩ	0402	Panasonic ERJ-2RKF4701X RES, 4.70 k, 1%, 0.1 W
1	R39	10kΩ	0805	Panasonic ERJ-6GEYJ103V RES, 10 k, 5%, 0.125 W
4	R41, R42, R68, R69	0Ω	0603	Panasonic ERJ-3GEY0R00V RES, 0, 5%, 0.1 W
1	R45	11kΩ	0805	Panasonic ERJ-6ENF1102V RES, 11.0 k, 1%, 0.125 W
1	R46	3kΩ	0805	Panasonic ERJ-6ENF3001V RES, 3.00 k, 1%, 0.125 W, AEC-Q200 Grade 0
2	R47, R107	0Ω	0805	Panasonic ERJ-6GEY0R00V RES, 0, 5%, 0.125 W
2	R48, R49	49.9Ω	0402	Panasonic ERJ-2RKF49R9X RES, 49.9, 1%, 0.1 W
7	R51, R54, R56, R60, R62, R96, R98	10kΩ	0603	Panasonic ERJ-3EKF1002V RES, 10.0 k, 1%, 0.1 W
2	R52, R53	100Ω	0402	Panasonic ERJ-2RKF1000X RES, 100, 1%, 0.1 W
1	R59	16.5kΩ	0603	Panasonic ERJ-3EKF1652V RES, 16.5 k, 1%, 0.1 W
1	R61	4.53kΩ	0603	Panasonic ERJ-3EKF4531V RES, 4.53 k, 1%, 0.1 W
1	R74	49.9Ω	0603	Panasonic ERJ-3EKF49R9V RES, 49.9, 1%, 0.1 W
2	R83, R87	1kΩ	0603	Panasonic ERJ-3EKF1001V RES, 1.00 k, 1%, 0.1 W
1	R100	53kΩ	0603	Vishay-Dale PAT0603E5302BST1 RES, 53.0 k, 0.1%, 0.15 W
1	R102	34kΩ	0603	Panasonic ERJ-3EKF3402V RES, 34.0 k, 1%, 0.1 W
2	R103, R104	20kΩ	0603	Panasonic ERJ-3EKF2002V RES, 20.0 k, 1%, 0.1 W
1	R105	30kΩ	0603	Panasonic ERJ-3EKF3002V RES, 30.0 k, 1%, 0.1 W
1	R106	5.69kΩ	0603	Vishay-Dale PAT0603E5691BST1 RES, 5.69 k, 0.1%, 0.15 W
1	R108	0kΩ	2512	Vishay-Dale CRCW25120000Z0EGHP RES, 0, 5%, 1.5 W, AEC-Q200 Grade 0
1	S1	Switch		Grayhill 78B07ST Switch, 7 SPST, 0.15 A, 30 V, TH
1	S2	Switch		Grayhill 78B03ST Switch, 3 SPST, 0.15 A, 30 V, TH
2	S3, S4	Switch	SMD	Panasonic EVQPNF04M Switch, Tactile, SPST-NO, 0.05A, 12V, SMD
1	U1	IC	RHS0048A	Texas Instruments DS90UB914ATRHSTQ1 FPD-Link III Serializer and Deserializer
2	U3, U4	LDO	SOT-223	Texas Instruments LP38693MP-ADJ/NOPB 500mA Low Dropout CMOS Linear Regulators with Adjustable Output Stable with Ceramic Output Capacitors, Pb-Free
1	U5	Switcher	SOT-23	Texas Instruments LM3671MF-1.8/NOPB 2MHz, 600mA Step-Down DC-DC Converter, Pb-Free
2	U6, U8	Inverter	SOT-353	Fairchild Semiconductor NC7SP04P5X TinyLogic ULP Inverter
2	U7, U9	Flip-Flop	SOT-363	Fairchild Semiconductor NC7SZ175P6X TinyLogic UHS D-Type Flip-Flop with Asynchronous Clear
0	C1, C11	5pF	0402	MuRata GRM1555C1H5R0CA01D CAP, CERM, 5 pF, 50 V, +/- 5%, C0G/NP0
0	C4, C5	0.1µF	0603	MuRata GRM188R72A104KA35D CAP, CERM, 0.1 µF, 100 V, +/- 10%, X7R

Table C-2. DS90UB914A-CXEVM BOM (continued)

Qty.	Reference	Part	PCB Footprint	MFR and Part#
0	C19, C20	10pF	0402	MuRata GRM1555C1H100JA01D CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0
0	C67, C68, C71, C74	0.1µF	0402	MuRata GRM155R71C104KA88D CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R
0	C69, C70	22µF	1206_190	TDK C3216X5R1E226M160AB CAP, CERM, 22 µF, 25 V, +/- 20%, X5R
0	C76	12pF	0402	Kemet C0402C120J3GACAUTO CAP, CERM, 12 pF, 25 V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1
0	J1, J2, J3, J4	RF 50 Ohm		Emerson Network Power 142-0701-871 RF 50 Ohm Gold Connectors / Coaxial Connectors PC END
0	JP7	Header		Samtec TSW-116-07-G-D Header, 100mil, 16x2, Gold, TH
0	L1	165µH	SMD	Coilcraft KA4909-AL Inductor, Wirewound, Ferrite, 165 µH, 0.65 A, 0.46 ohm, SMD
0	L4	Common-Mode Choke	SMD	MuRata DLW21SN261XQ2L Coupled inductor, 0.22 A, 0.59 ohm, SMD
0	L5, L6	10µH	SMD	Coilcraft 1008PS-103KLB Inductor, Shielded, Ferrite, 10 µH, 0.4 A, 0.92 ohm, SMD
0	P1	RF 50 Ohm		Rosenberger D4S20L-40MA5-Z Right Angle Plug for PCB, TH
0	R36, R37, R55, R57, R58, R97, R99	0Ω	0603	Panasonic ERJ-3GEY0R00V RES, 0, 5%, 0.1 W
0	R70, R71, R72, R73, R75, R76, R77, R78, R79, R80, R81, R82, R84, R85, R86	0Ω	0402	Panasonic ERJ-2GE0R00X RES, 0, 5%, 0.063 W
0	R101	1kΩ	0603	Vishay-Dale CRCW06031K00FKEA RES, 1.00 k, 1%, 0.1 W
0	U2	ESD	SOT (DRL)	Texas Instruments TPD2E001DRLR Low-Capacitance + / - 15 kV ESD-Protection Array for High-Speed Data Interfaces, 2 Channels, -40 to +85 degC, Green (RoHS & no Sb/Br)
0	U21	Switcher	PWP0014E	Texas Instruments TPS65320QPWPRQ1 40-V Step-Down Converter With Eco-mode and LDO Regulator

Revision History

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

Changes from A Revision (June 2015) to B Revision **Page**

- Changes made to frequency ranges supported. 11
- Changed the indication color of USB2ANY from RED to GREEN. 12
- Removed paragraph below Figure 3-1. 12
- Updated all schematic images (for both 913A & 914A devices) - new schematics include ferrite bead on PoC networks. 21
- Added PCB layout images and stackup information for both devices. 30
- Revised both 913A and 914A BOM tables to match updated schematics. 56

STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.

   1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software

   1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 *Limited Warranty and Related Remedies/Disclaimers*:

   2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

   2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

   2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 *Regulatory Notices:*

   3.1 *United States*

      3.1.1 *Notice applicable to EVMs not FCC-Approved:*

      This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

      3.1.2 *For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:*

      CAUTION

      This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

      Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

      FCC Interference Statement for Class A EVM devices

      NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

3.2 *Canada*

3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur

3.3 *Japan*

3.3.1 *Notice for EVMs delivered in Japan:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。 技術適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

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4 *EVM Use Restrictions and Warnings:*

4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 *Safety-Related Warnings and Restrictions:*

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