DS90Ux949EVM User's Guide

User's Guide

Literature Number: SNLU169
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DS90Ux949EVM User's Guide

1.1 General Description

The DS90Ux949-Q1EVM (Evaluation Module) converts HDMI to FPD-Link III. This kit will demonstrate the functionality and operation of the DS90Ux949-Q1. The DS90Ux949-Q1 is an HDMI to FPD-Link III Serializer which, in conjunction with the DS90Ux940-Q1/DS90Ux948-Q1 Deserializers, takes the data from HDMI serial stream and translates it into either single- or dual-lane FPD-Link III interface. The DS90Ux949-Q1 supports video resolutions up to WUXGA and 1080p60 with 24-bit color depth.

The FPD-Link III interface supports video and audio data transmission and full duplex control, including I2C and SPI communication, over the same differential link. In backward compatible mode, the device supports up to WXGA and 720p resolutions with 24-bit color depth over a single differential link.

The device supports up to 7.1 audio channels. Audio data received from the HDMI stream is encrypted, serialized, and sent out on the FPD-Link III stream to a compatible deserializer. Up to 8-channel I2S interface with maximum bit rate of 192 kHz.

The demo board is not intended for EMI testing. The demo board was designed for easy accessibility to device pins with tap points for monitoring or applying signals, additional pads for termination, and multiple connector options.

1.2 Features

- Supports Pixel Clock Frequency up to 170 MHz for WUXGA (1920x1200) and 1080p60 resolutions with 24-bit Color Depth
- HDMI Receiver to accept HDMI as input
- Dual FPD-Link III output interface
  - Single Channel: Up to 96 MHz Pixel Clock
  - Dual Channel: Up to 170 MHz Pixel Clock
- Up to 15 meters over Single-Ended Coaxial or Differential Shielded Twisted-Pair (STP) cable
- Backwards Compatible to DS90Ux926Q-Q1, DS90Ux928-Q1, DS90Ux940-Q1, and DS90Ux948-Q1 FPD-Link III Deserializers
- @Speed BIST
- Supports 7.1 multiple I2S (4 data) channels
- Single +12V power supply for EVM
- 1.8V LVCMOS I/O interface
- 1.8V or 3.3V compatible LVCMOS I^2C interface
- Automotive grade product: AEC-Q100 Grade 2 qualified

1.3 System Requirements

In order to demonstrate, the following is required:

1. FPD-Link III compatible Deserializer
   (a) DS90Ux940-Q1, DS90Ux948-Q1 up to 1080p60
   (b) DS90Ux926Q-Q1, DS90Ux928-Q1 up to 720p60
2. HDMI source
3. Optional I^2C controller
4. Power supply for 12V @ 1A (required)

1.4 Contents of the Demo Evaluation Kit

1. One EVM board with the DS90Ux949-Q1

1.5 Applications Diagram

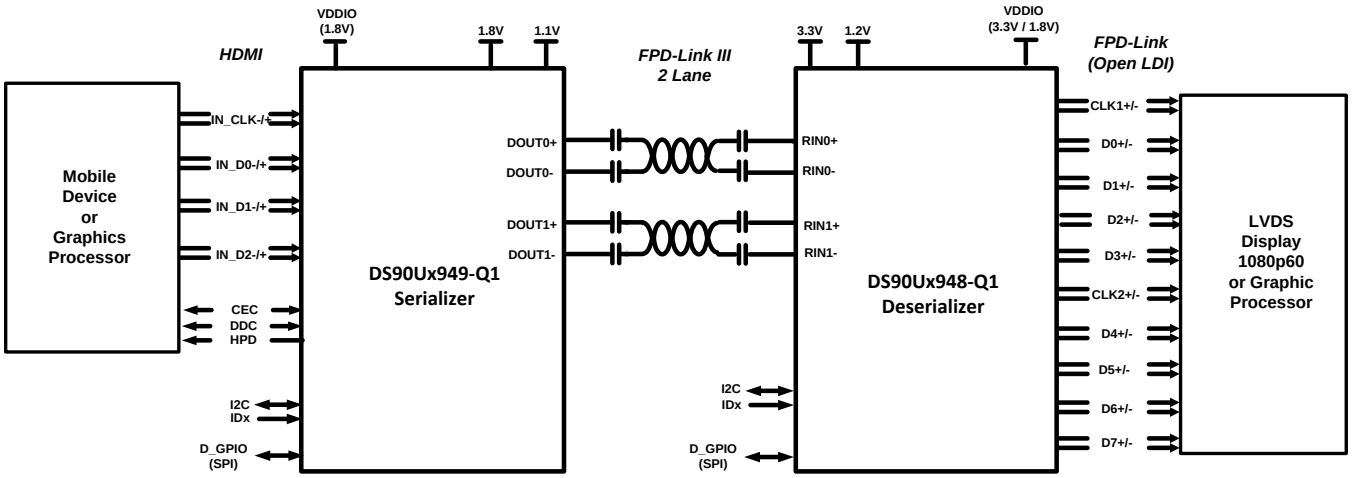


Figure 1-1. Applications Diagram

1.6 Typical Configuration

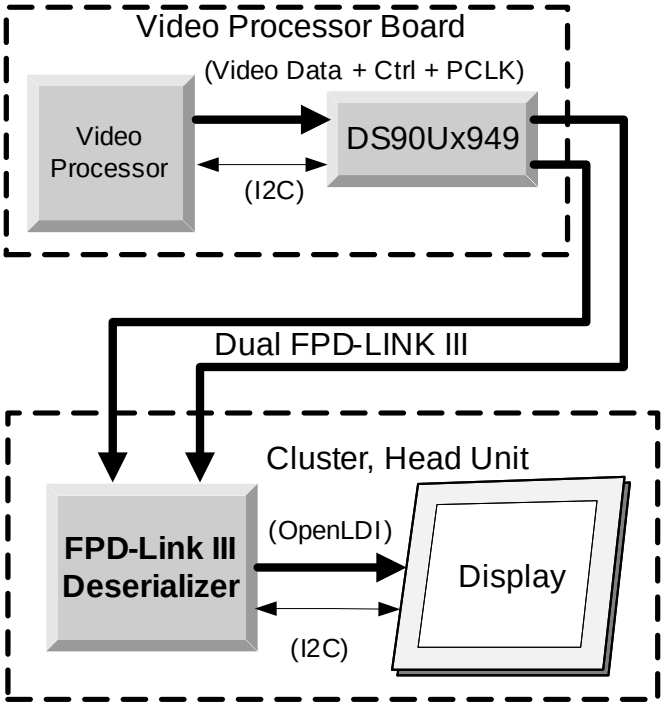


Figure 1-2. Typical Configuration

Figure 1-1 and Figure 1-2 illustrate the use of the chipset in a display application.

1.7 Quick Start Guide

1. Configure switches S2, S3, and S6 to set device's operating modes
   - S2: MODE_SEL0 = 1 (default factory setting)
   - S3: IDx = 0x18 (default factory setting)
   - S6: MODE_SEL1 = 1 (default factory setting)
2. Connect P1 (DOUT[1:0]+/-) to compatible Deserializer e.g. DS90Ux940-Q1/DS90Ux948-Q1 using STP cable (default)
3. Connect J36 to 12V.

   (a) Optional power options available (see Table 1-3)
4. Plug in HDMI source
5. Connect J29 with miniUSB (5-pin_ to USB A (4-pin) cable to PC USB port

For details of pin-names and pin-functions, please refer to the DS90Ux949Q datasheet.

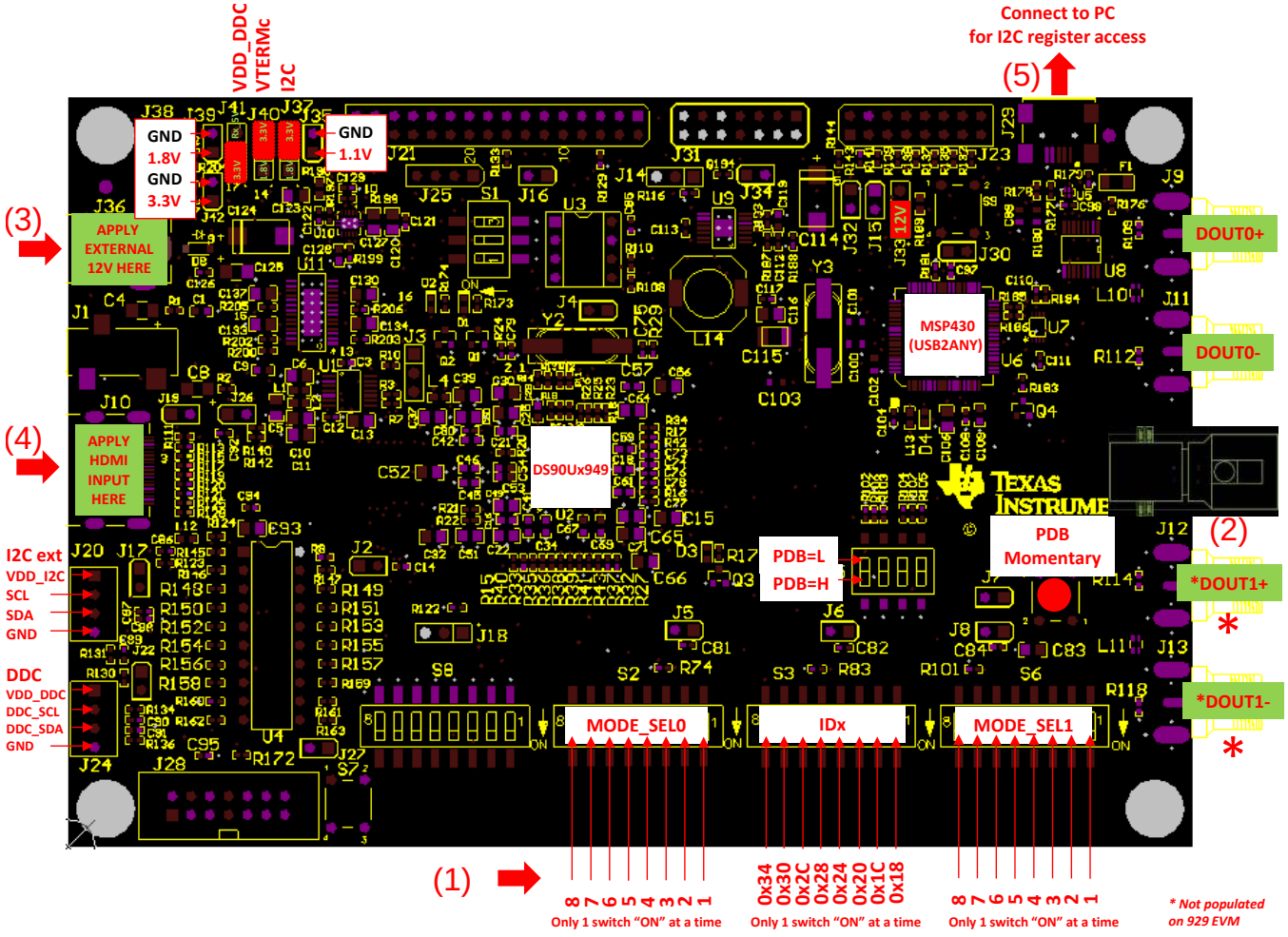


Figure 1-3. Interfacing to the EVM

1.8 Default Jumper Settings

Ensure that the board has the default board jumper settings:

Table 1-1. Default Board Jumper Settings

Jumper	Jumper Settings
J3	Connect 2 and 3
J14	Connect 2 and 3
J17	Connect 1 and 2
J18	Connect 2 and 3
J22	Connect 1 and 2
J33	Connect 1 and 2
J37	Connect 2 and 3
J40	Connect 2 and 3
J41	Connect 2 and 3

1.9 Default Switch Settings

Ensure that the board has the default board switch settings:

Table 1-2. Default Board Switch Settings

Switch	Switch Settings
S1	1 to 3 ON
S2	1 ON, 2 to 8 OFF
S3	1 ON, 2 to 8 OFF
S5	All OFF
S6	1 ON, 2 to 8 OFF

1.10 Demo Board Connections

Table 1-3. Power Supply

Designator	Signal	Description
J36	+12V	12V ±5% Main Power, Single +12V power connector that supplies power to the entire board.
J35.1 (Optional)	+1.1V	1.1V ±5%, Alternative to Main Power. **If used, remove R195.**
J39.1 (Optional)	+1.8V	1.8V ±5%, Alternative to Main Power. **If used, remove R204.**
J42.1 (Optional)	+3.3V	3.3V ±5%, Alternative to Main Power. **If used, remove R207.**
J33.2 (Optional)	+5V	5V ±5%, Alternative to Main Power.

Table 1-4. FPD-Link III Output Signals P1

Designator	Port	Signal
P1.1	FPD-Link III Port 0	DOUT0-
P1.3		DOUT0+
P1.2	FPD-Link III Port 1	DOUT1-
P1.4		DOUT1+

Table 1-5. Alternative FPD-Link III Output Signals

Designator	Port	Signal
J11	FPD-Link III Port 0	DOUT0-
J9		DOUT0+
J13	FPD-Link III Port 1	DOUT1-
J12		DOUT1+

Table 1-6. HDMI Input Signals

Designator	Signal	Description
J10.12 J10.10	IN_CLK- IN_CLK+	HDMI TMDS clock input
J10.9 J10.7	IN_D0- IN_D0+	HDMI TMDS data0 input
J10.6 J10.4	IN_D1- IN_D1+	HDMI TMDS data1 input
J10.3 J10.1	IN_D2- IN_D2+	HDMI TMDS data2 input

Table 1-7. USB2ANY Connector

Designator	Description
J29	mini USB 5 pin

Table 1-8. I2C/CCI Interface Header J20

Designator	Signal
J20.1	VDDI2C
J20.2	SCL
J20.3	SDA
J20.4	GND

Table 1-9. GPIO/Audio Interface

Designator	Signal	Description
J21.18	SDIN/GPIO0	Aux I2S Data Input / Remote or Local I/O
J21.20	SWC/GPIO1	Aux I2S Word Clock Output / Remote or Local I/O
J21.2	I2S_DC/GPIO2	I2S Data Input / Remote or Local I/O
J21.4	I2S_DD/GPIO3	I2S Data Input / Remote or Local I/O
J21.6	VDDIO	GPIO Voltage Level 1.8V
J21.8	I2S_DB/GPIO5_REG	I2S Data Input / Local only I/O
J21.10	I2S_DA/GPIO6_REG	I2S Data Input / Local only I/O
J21.12	I2S_WC/GPIO7_REG	I2S Word Clock Input / Local only I/O
J21.14	I2S_CLK/GPIO8_REG	I2S Clock Input / Local only I/O
J21.24	MCLK	I2S System Clock Output

Table 1-10. SPI/D_GPIO Interface

Designator	Signal	Description
J21.6	VDDIO	GPIO Voltage Level 1.8V
J21.32	D_GPIO3/SS	I/O in Dual FPD-Link III mode / Slave Select
J21.30	D_GPIO2/SCLK	I/O in Dual FPD-Link III mode / Serial Clock
J21.28	D_GPIO1/MISO	I/O in Dual FPD-Link III mode / Master In, Slave Out
J21.26	D_GPIO0/MOSI	I/O in Dual FPD-Link III mode / Master Out, Slave In

Configuration of the device may be done via the MODE_SEL[1:0]. These modes are latched into register location during power-up:

Table 1-11. MODE_SEL[1:0] Settings

Mode	Setting	Function
EDID_SEL: Display ID Select	0	Look for remote EDID, if none found, use internal SRAM EDID. Can be overridden from register. Remote EDID address may be overridden from default 0xA0.
	1	Use external local EDID.
AUTO-SS: Auto Sleep-State	0	Disable.
	1	Enable.
AUX_I2S: AUX Audio Channel	0	HDMI audio.
	1	HDMI + AUX audio channel.
EXT_CTL: External Controller Override	0	Internal HDCP/HDMI control.
	1	External HDCP/HDMI control from I2C interface pins.
COAX: Cable Type	0	Enable FPD-Link III for twisted pair cabling.
	1	Enable FPD-Link III for coaxial cabling.
REM_EDID_LOAD: Remote EDID Load	0	Use internal SRAM EDID.
	1	If available, remote EDID is copied into internal SRAM EDID.

Table 1-12. Configuration Select (MODE_SEL0) -- SW-DIP8 - S2(1)

MODE #	EDID_SEL	AUTO_SS	AUX_I2S
1	0	0	0
2	0	0	1

(1) Only set one high.

Table 1-12. Configuration Select (MODE_SEL0) -- SW-DIP8 - S2[1] (continued)

MODE #	EDID_SEL	AUTO_SS	AUX_I2S
3	0	1	0
4	0	1	1
5	1	0	0
6	1	0	1
7	1	1	0
8	1	1	1

Table 1-13. Configuration Select (MODE_SEL1) - SW-DIP8 - S6[1]

MODE #	EXT_CTL	COAX	REM_EDID_LOAD
1	0	0	0
2	0	0	1
3	0	1	0
4	0	1	1
5	1	0	0
6	1	0	1
7	1	1	0
8	1	1	1

(1) Only set one high.

The strapped values can be viewed and/or modified in the following locations:

- EDID_SEL : Latched into BRIDGE_CTL[0], EDID_DISABLE (0x4F[0]).
- AUTO_SS : Latched into Register 0x1[7], SOFT_SLEEP.
- AUX_I2S : Latched into BRIDGE_CFG[1], AUDIO_MODE[1] (0x54[1]).
- EXT_CTL: Latched into BRIDGE_CFG[7], EXT_CONTROL (0x54[7]).
- COAX : Latched into DUAL_CTL1[7], COAX_MODE (0x5B[7]).
- REM_EDID_LOAD : Latched into BRIDGE_CFG[5] (0x54[5]).

Table 1-14. IDx SW-DIP8 - S3[1]

Designator	7-Bit Address	8-Bit Address
S1.1 (Default)	0x0C	0x18
S1.2	0x0E	0x1C
S1.3	0x10	0x20
S1.4	0x12	0x24
S1.5	0x14	0x28
S1.6	0x16	0x2C
S1.7	0x18	0x30
S1.8	0x1A	0x34

(1) Only set one high.

1.11 ALP Software Setup

1.11.1 System Requirements

Operating System:	Windows 7 64-bit
USB:	USB2ANY
USB2ANY Firmware Version:	2.5.2.0

1.11.2 Download Contents

TI Analog LaunchPAD can be downloaded from: http://www.ti.com/tool/alp.

Download and extract the “snlc048.zip” file to a temporary location that can be deleted later.

Make sure J29 on the DS90Ux949 is connected to a PC USB port with USB cable and power is applied to the DS90Ux949 EVM.

The following installation instructions are for the Windows 7 64-bit Operating System.

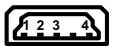
1.11.3 Installation of the ALP Software

Execute the ALP Setup Wizard program called “ALPF_setup_v_x_x_x.exe” that was extracted to a temporary location on the local drive of your PC.

There are 7 steps to the installation once the setup wizard is started:

1. Select the "Next" button.
2. Select “I accept the agreement” and then select the “Next” button.
3. Select the location to install the ALP software and then select the “Next” button.
4. Select the location for the start menu shortcut and then select the “Next” button.
5. There will then be a screen that allows the creation of a desktop icon. After selecting the desired choices select the “Next” button.
6. Select the “Install” button, and the software will then be installed to the selected location.
7. Uncheck “Launch Analog LaunchPAD” and select the “Finish” button. The ALP software will start if “Launch Analog LaunchPAD” is checked, but it will not be useful until the USB driver is installed and board is attached.

Connect J29 USB jack of the DS90Ux949Q EVM board to a PC/laptop USB port using a Type A 

A to mini-B 

MINI USB cable. Power the DS90Ux949Q EVB board with a 12 VDC power supply. The “Found New Hardware Wizard” will open on the PC/laptop.

1.11.4 Installation of the Device Profiles

There are 2 steps to add the DS90Ux949 profile:

1. Contact TI for the DS90Ux949 profile
2. Extract the “DS90Ux949.zip” to ALP’s profile folder. The profile folder can be found at: C:\Program Files (x64)\Texas Instruments\Analog LaunchPAD vx.x.x\Profiles\

1.11.5 Startup - Software Description

Make sure all the software has been installed and the hardware is powered on and connected to the PC. Execute “Analog LaunchPAD” shortcut from the start menu. The default start menu location is under All Programs > Texas Instruments > Analog LaunchPAD vx.x.x > Analog LaunchPAD to start MainGUI.exe.

Figure 1-4. Launching ALP

The application should come up in the state shown in the figure below. If it does not, see Section 1.12, "Troubleshooting ALP Software".

Under the Devices tab click on "DS90Ux949" to select the device and open up the device profile and its associated tabs.

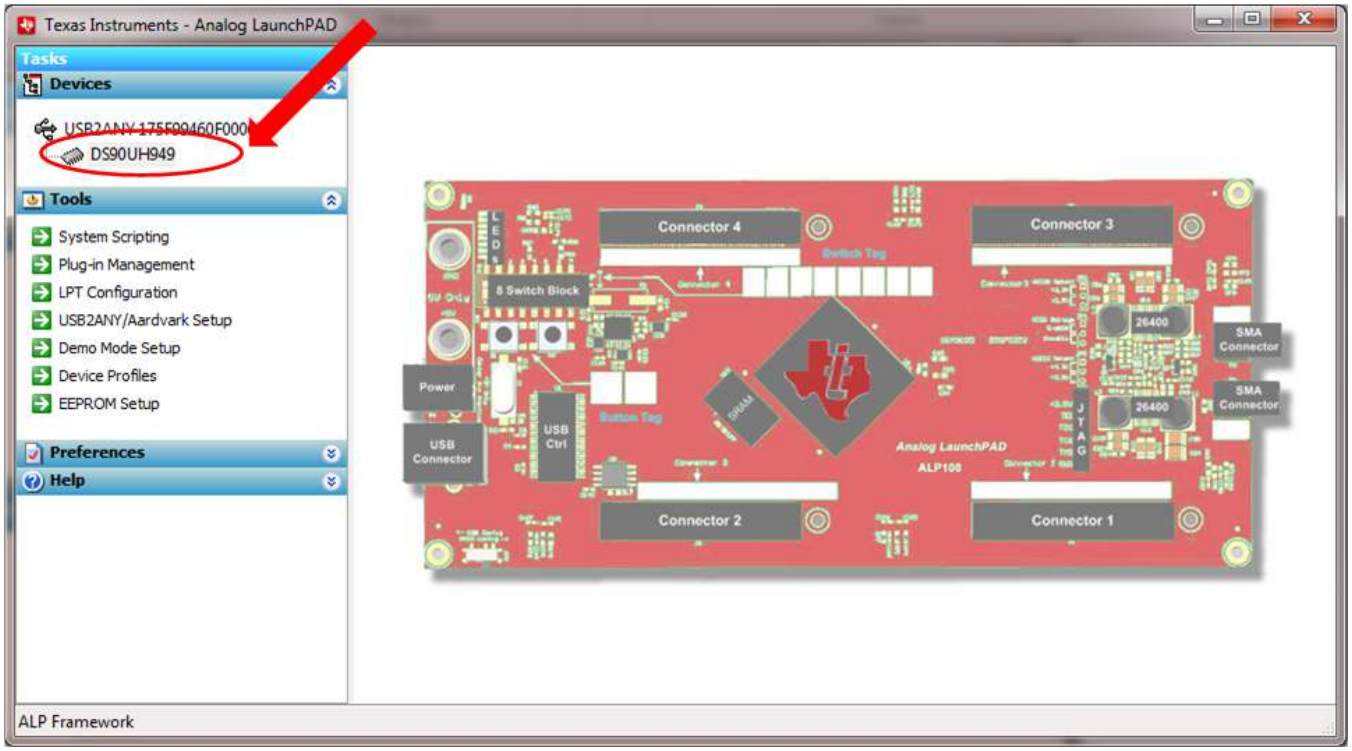


Figure 1-5. Initial ALP Screen

After selecting the DS90Ux949, the following screen should appear.

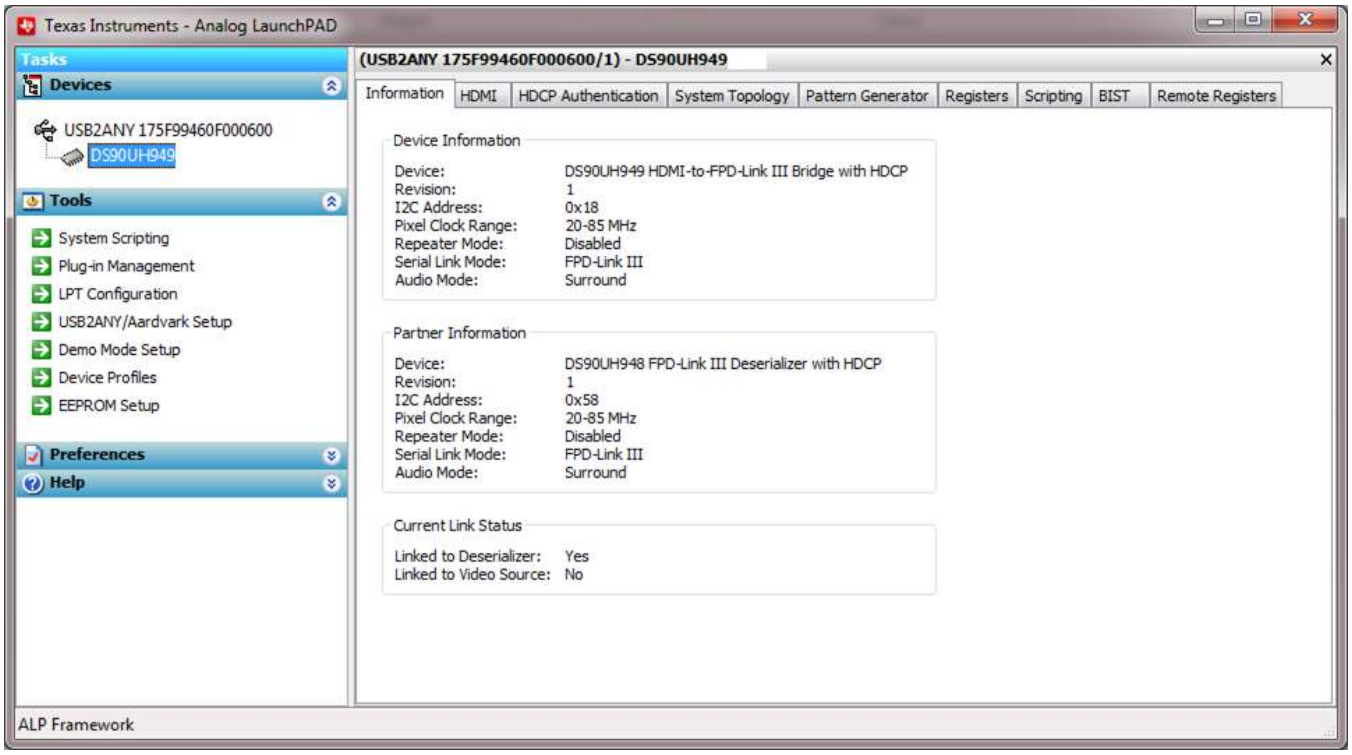


Figure 1-6. Follow-up Screen

1.11.6 Information Tab

The Information tab is shown below. Please note the device revision could be different.

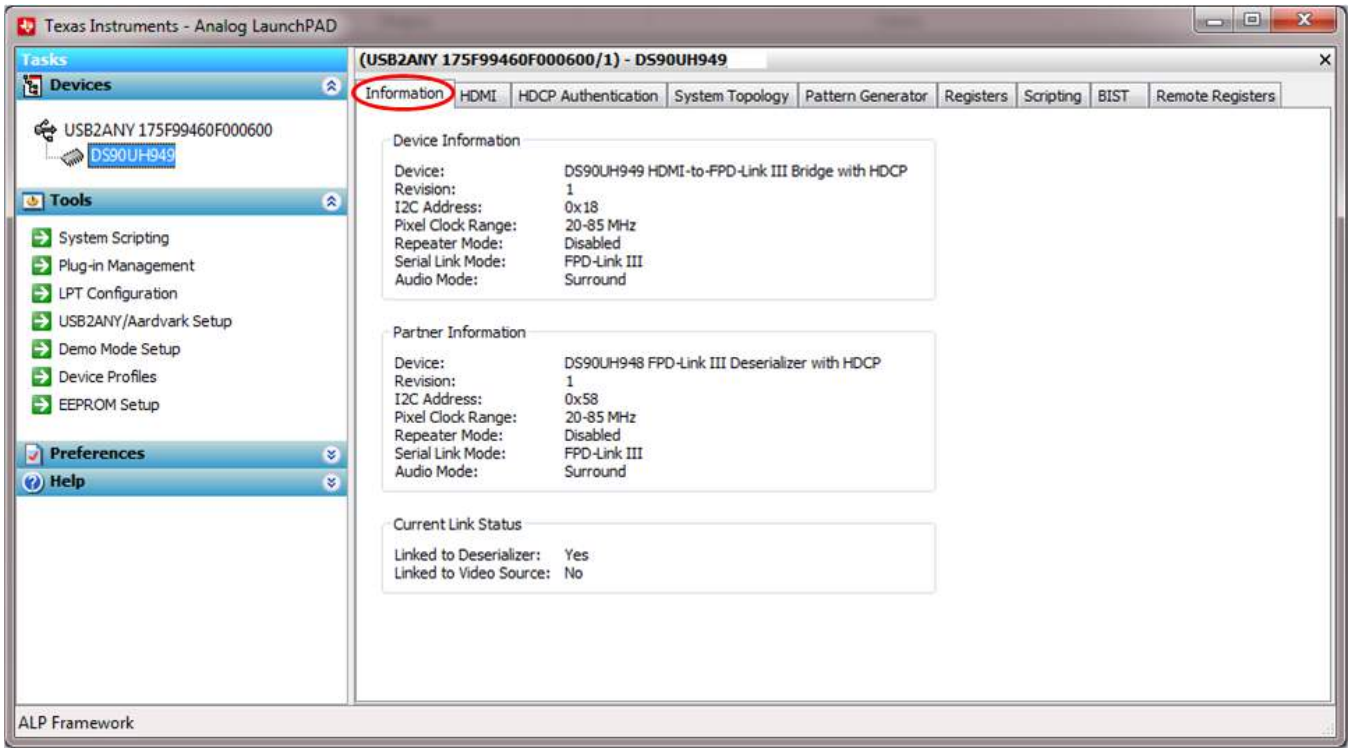


Figure 1-7. ALP Information Tab

1.11.7 HDMI Tab

The HDMI tab is shown below.

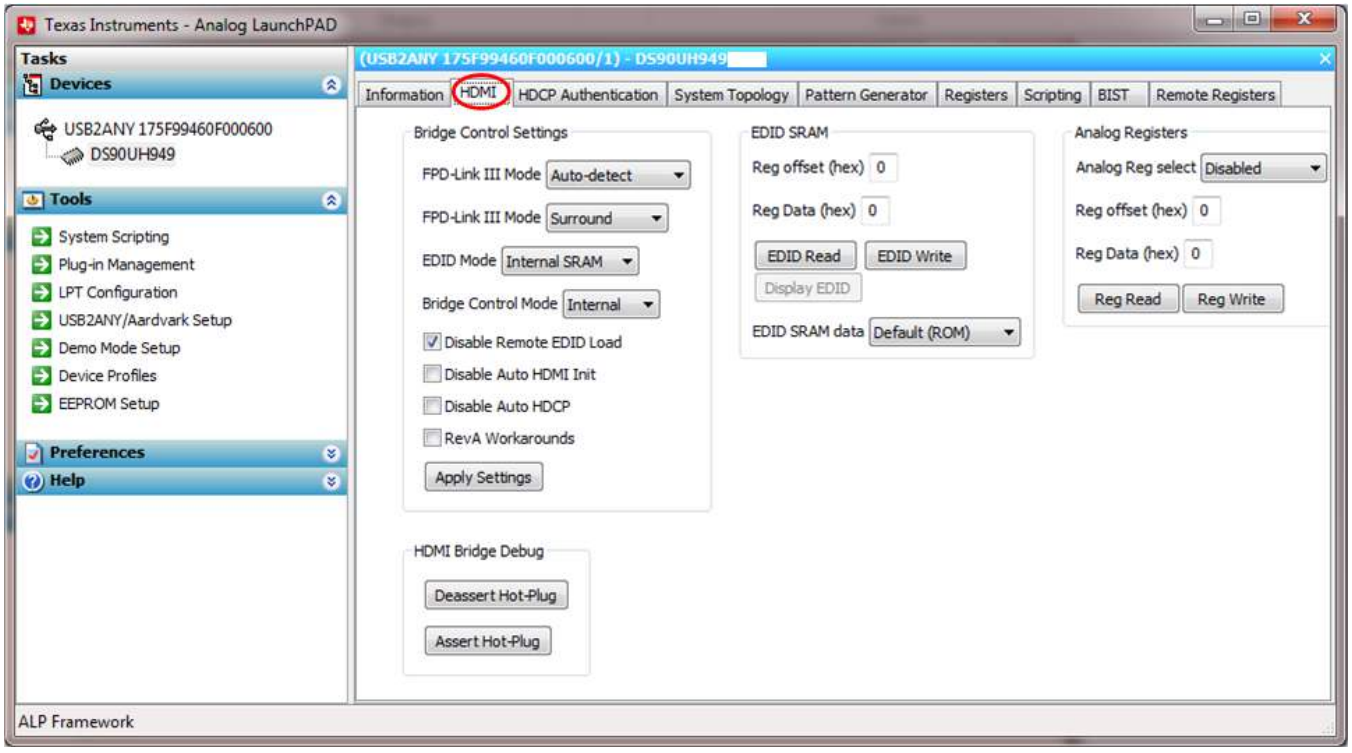


Figure 1-8. ALP HDMI Tab

1.11.8 Pattern Generator Tab

The SER Pattern Generator tab is shown below.

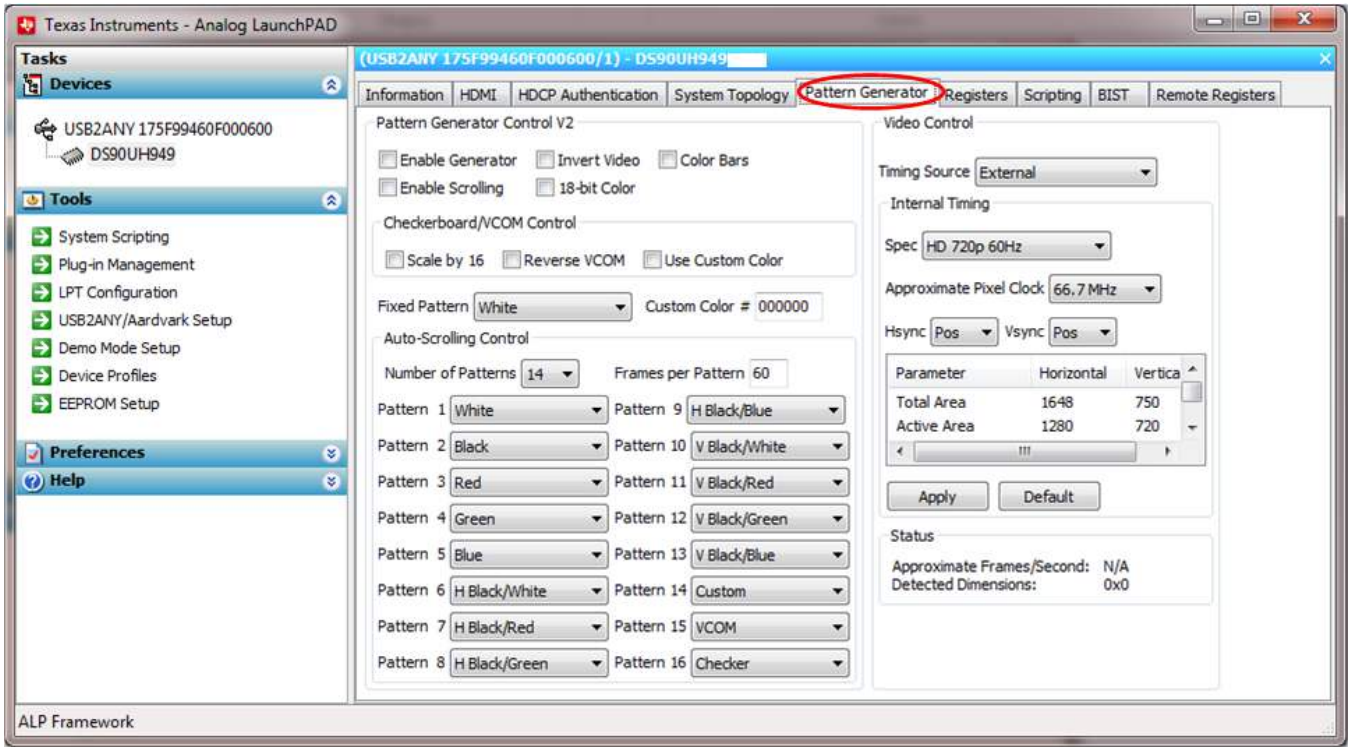


Figure 1-9. ALP Pattern Generator Tab

1.11.9 Registers Tab

The Registers tab is shown below.

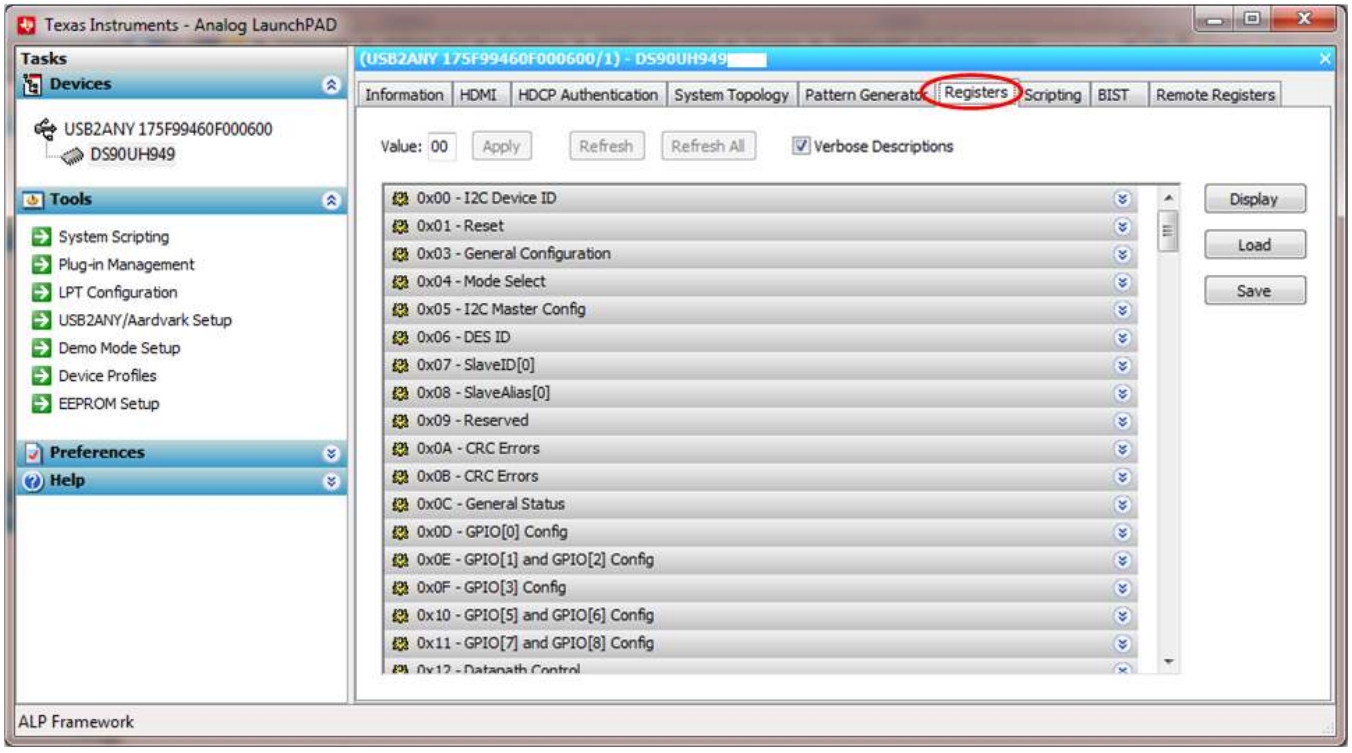


Figure 1-10. ALP Registers Tab

1.11.10 Registers Tab - Address 0x00 selected

Address 0x00 selected as shown below. Note that the “Value:” box, Value: 18 , will now show the hex value of that register.

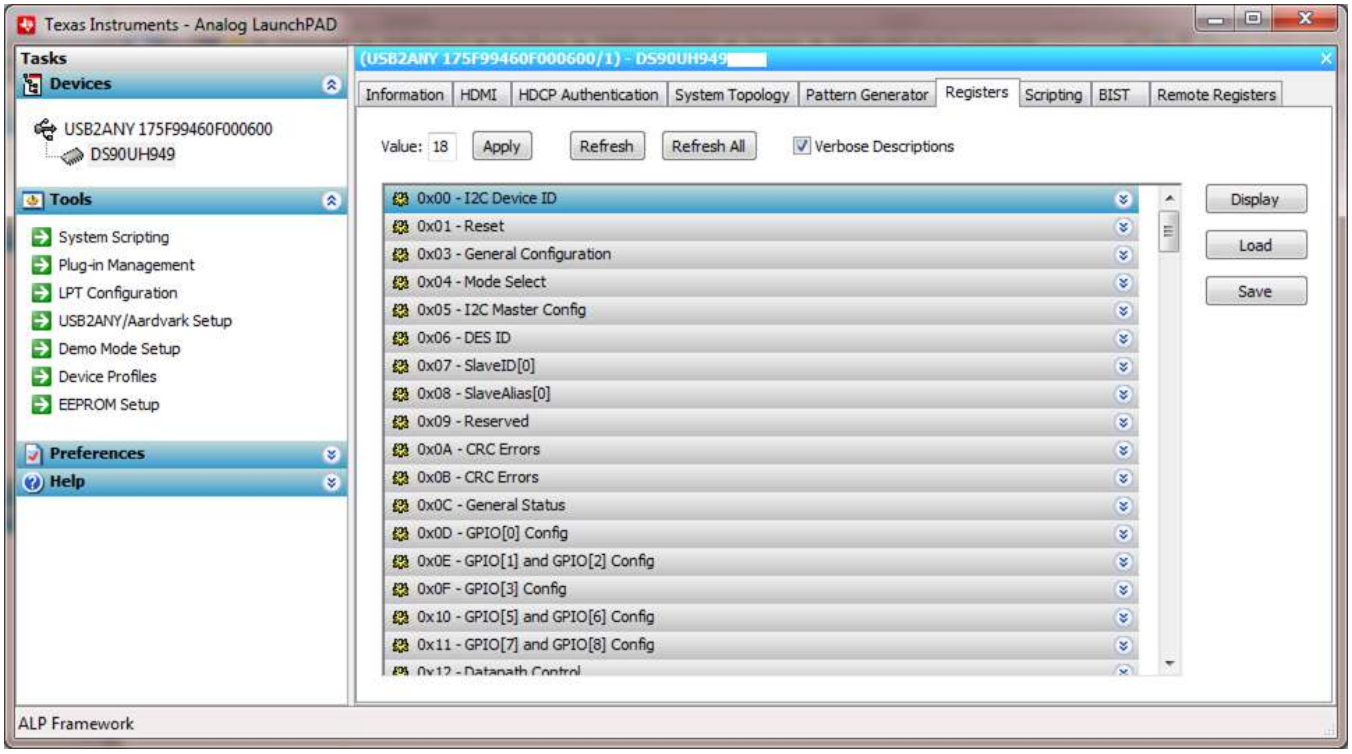


Figure 1-11. ALP Device ID Selected

1.11.11 Registers Tab - Address 0x00 expanded

By double clicking on the Address bar

or a single click on  . Address 0x00 expanded reveals contents by bits. Any register address displayed can be expanded.

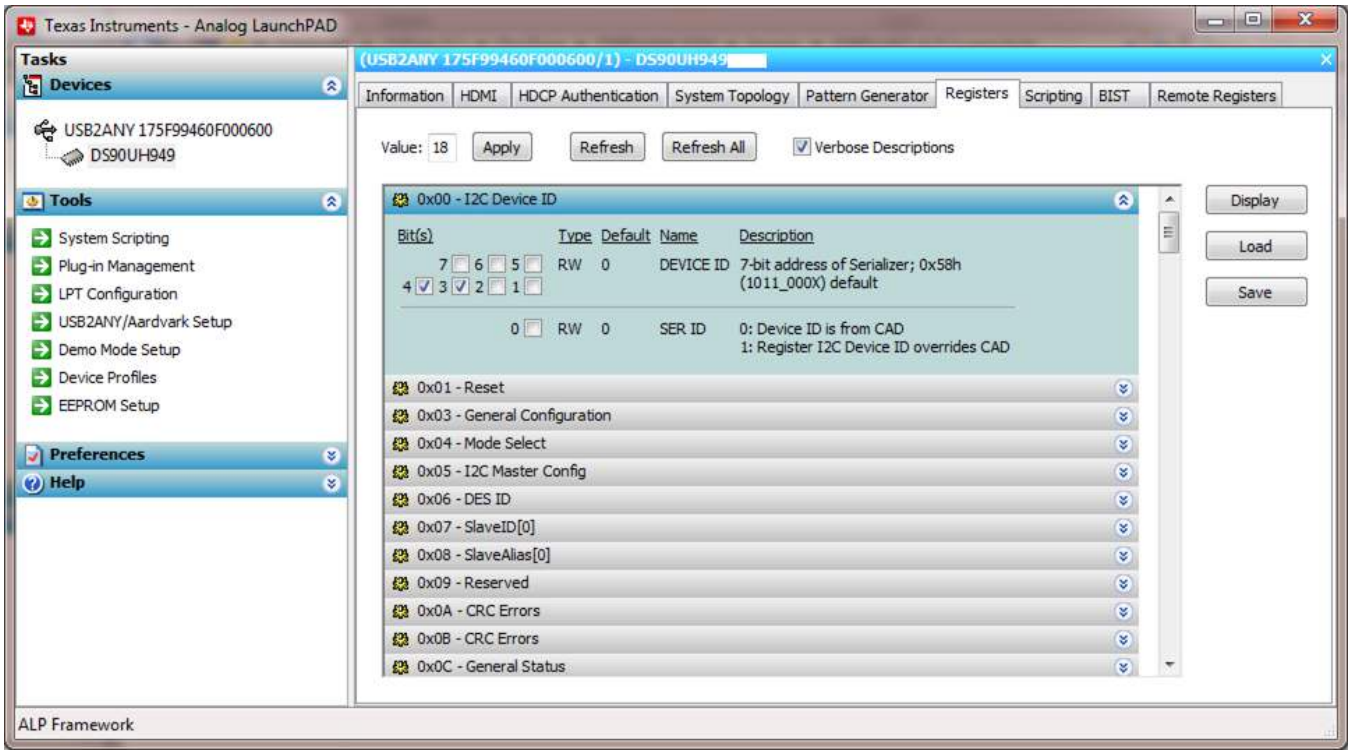
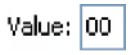
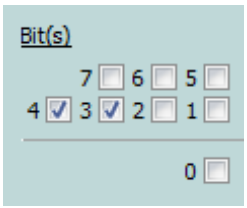


Figure 1-12. ALP Device ID Expanded

Any RW Type register, 

, can be written into by writing the hex value into the “Value:” box, 

or putting the pointer into the individual register bit(s) box by a left mouse click to put a check mark (indicating a “1”) or unchecking to remove the check mark (indicating a “0”). Click the “Apply” button to write to the register, and “refresh” to see the new value of the selected (highlighted) register.



The box toggles on every mouse click.

1.11.12 Scripting Tab

The Scripting tab is shown below.

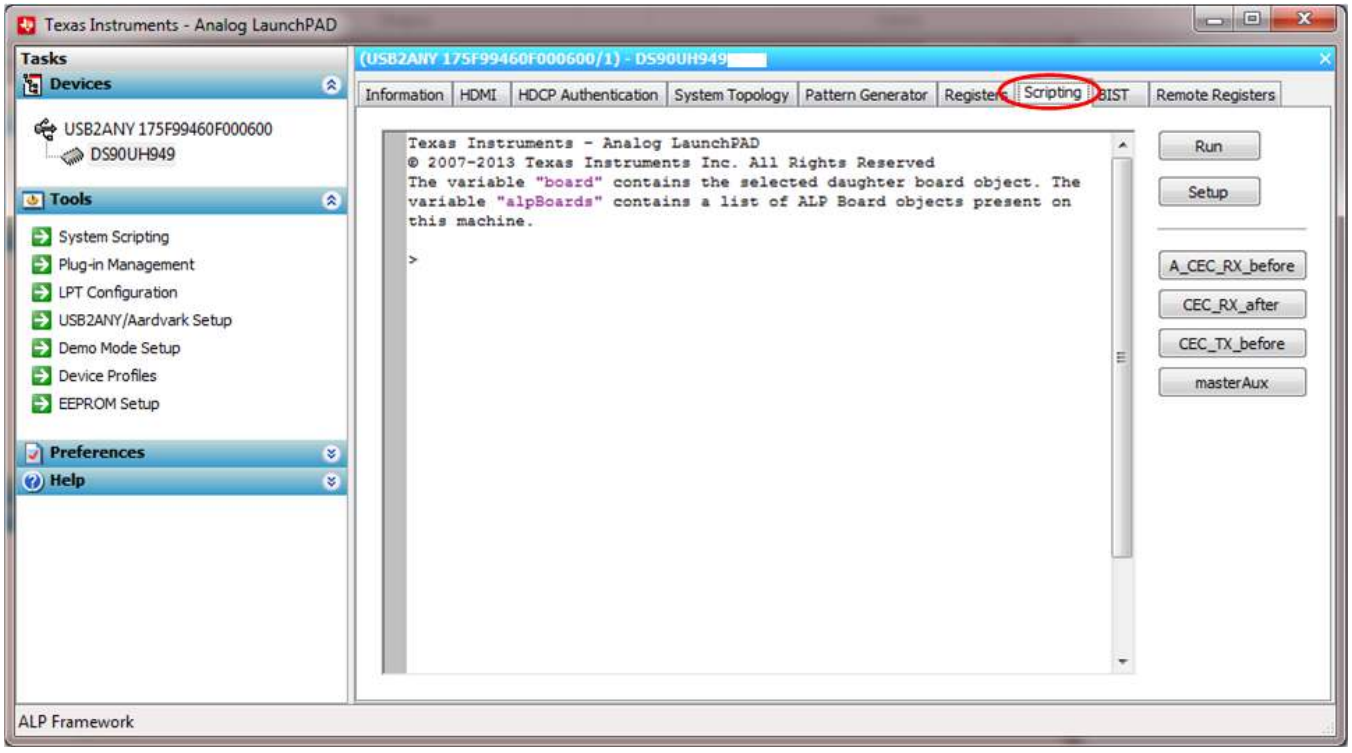


Figure 1-13. ALP Scripting Tab

The script window provides a full Python scripting environment which can be for running scripts and interacting with the device in an interactive or automated fashion.

WARNING

Directly interacting with devices either through register modifications or calling device support library functions can effect the performance and/or functionality of the user interface and may even crash the ALP Framework application.

1.12 Troubleshooting ALP Software

1.12.1 ALP Loads the Incorrect Profile

If ALP opens with the incorrect profile loaded the correct profile can be loaded from the USB2ANY/Aardvark Setup found under the tools menu.

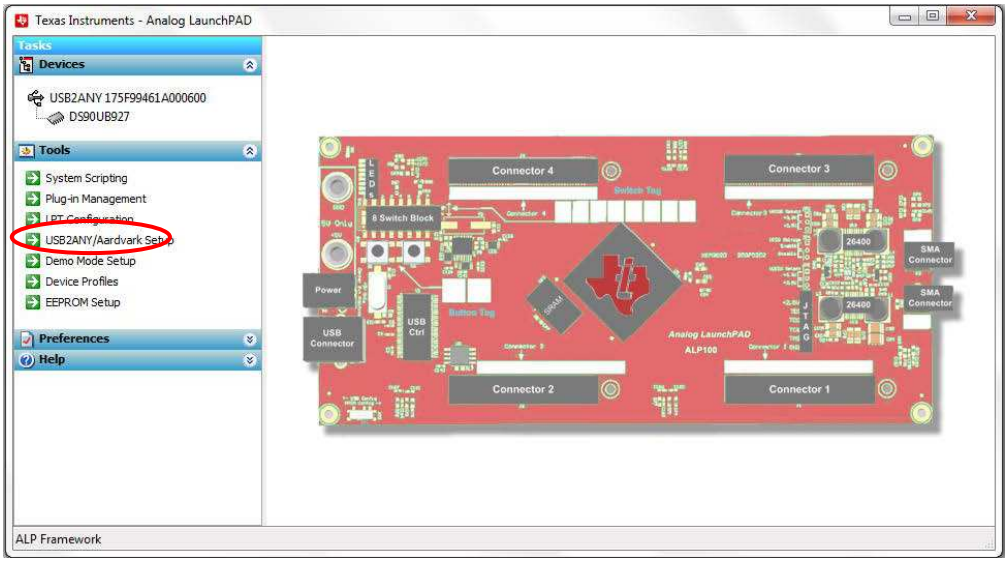


Figure 1-14. USB2ANY Setup

Highlight the incorrect profile in the Defined ALP Devices list and press the remove button.

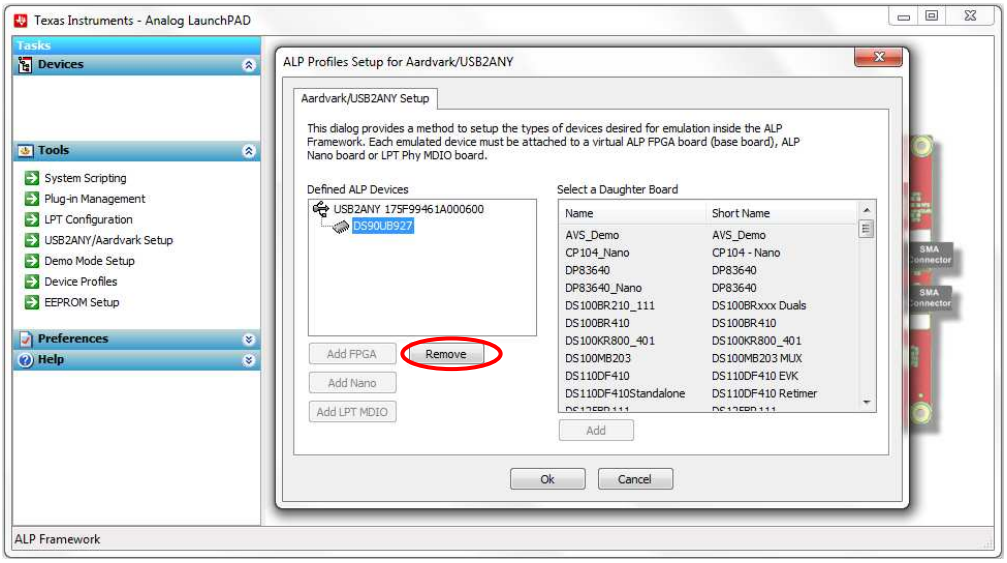


Figure 1-15. Remove Incorrect Profile

Find the correct profile under the Select a Daughter Board list, highlight the profile and press Add.

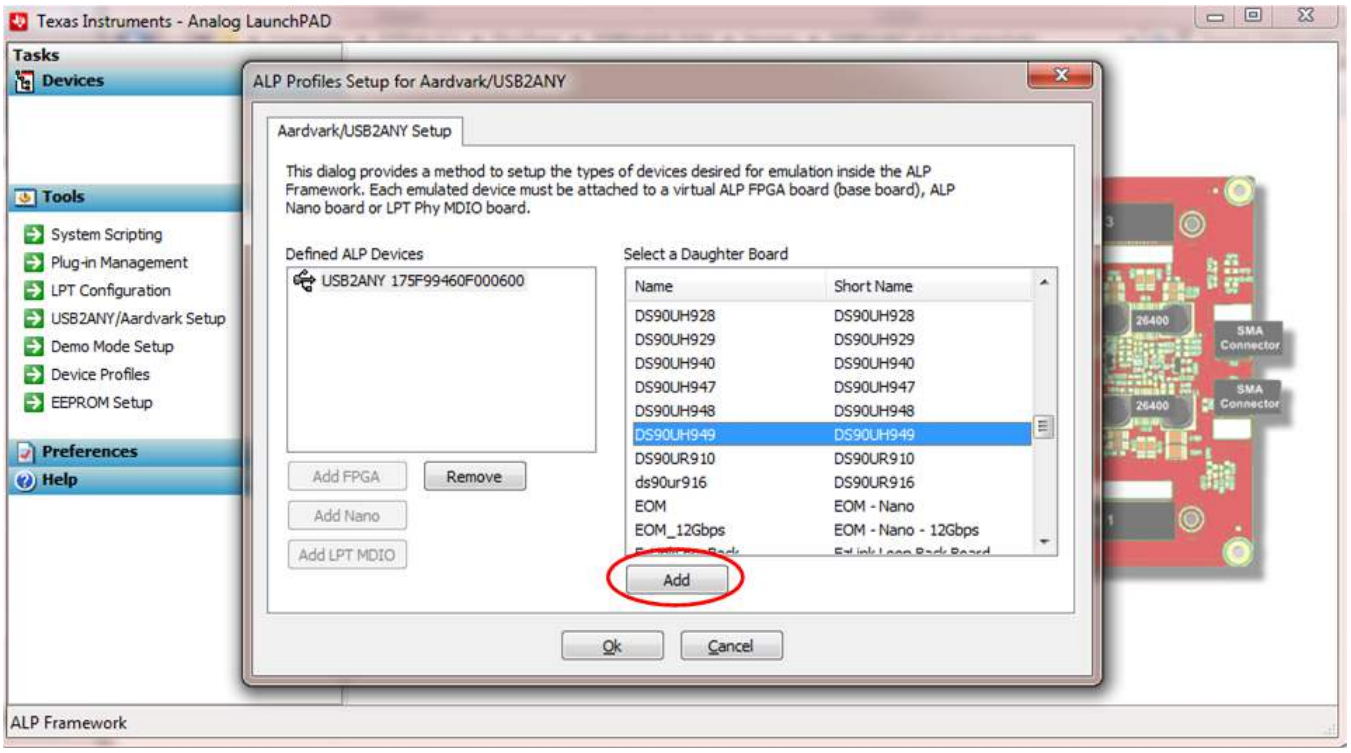


Figure 1-16. Add Correct Profile

Select Ok and the correct profile should now be loaded.

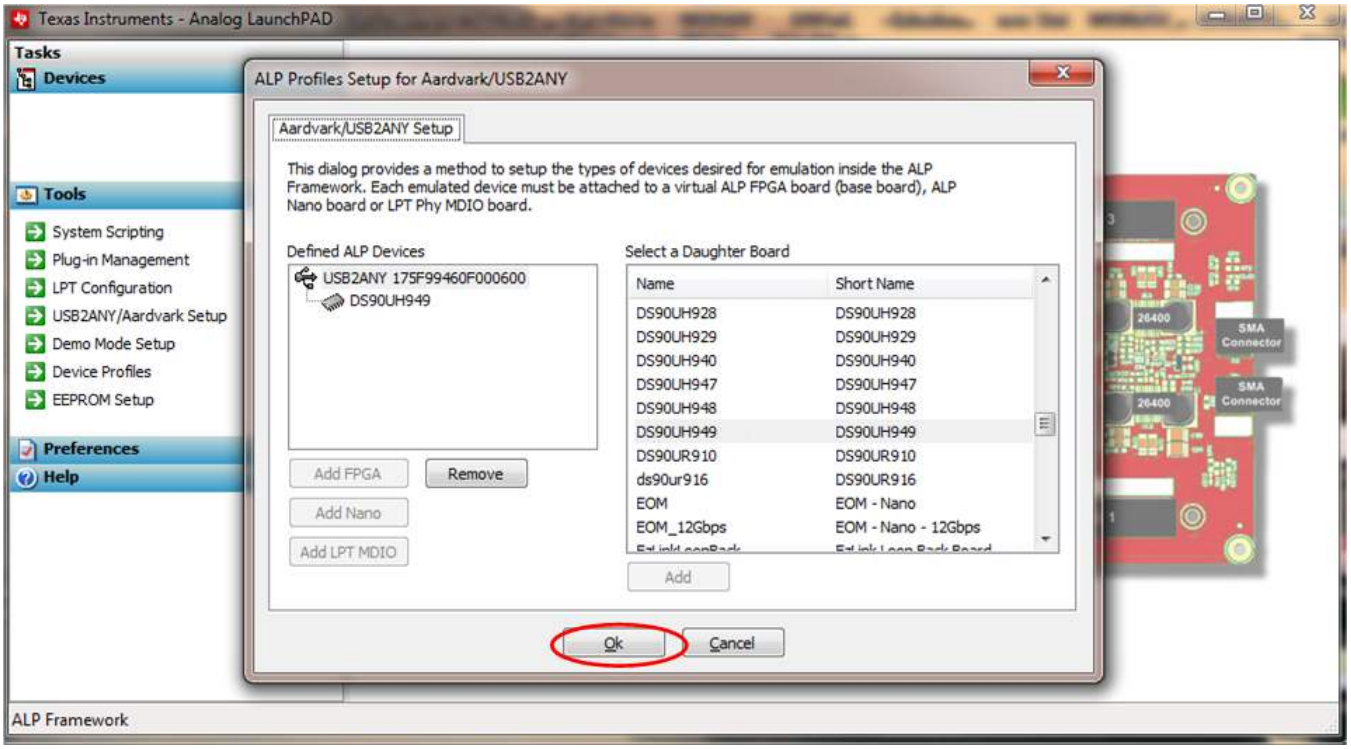


Figure 1-17. Finish Setup

1.12.2 ALP does not detect the EVM

If the following window opens after starting the ALP software, double check the hardware setup.

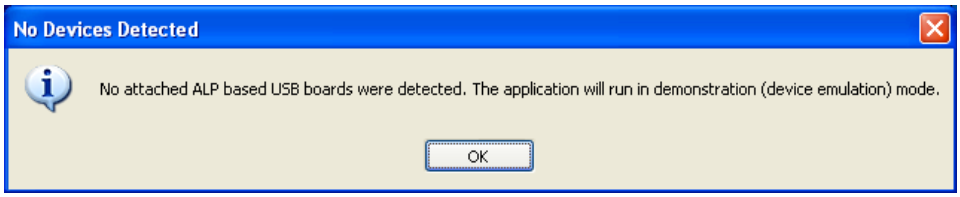


Figure 1-18. ALP No Devices Error

It may also be that the USB driver is not installed. Check the device manager. There should be a “HID-compliant device” under the “Human Interface Devices” as shown below.

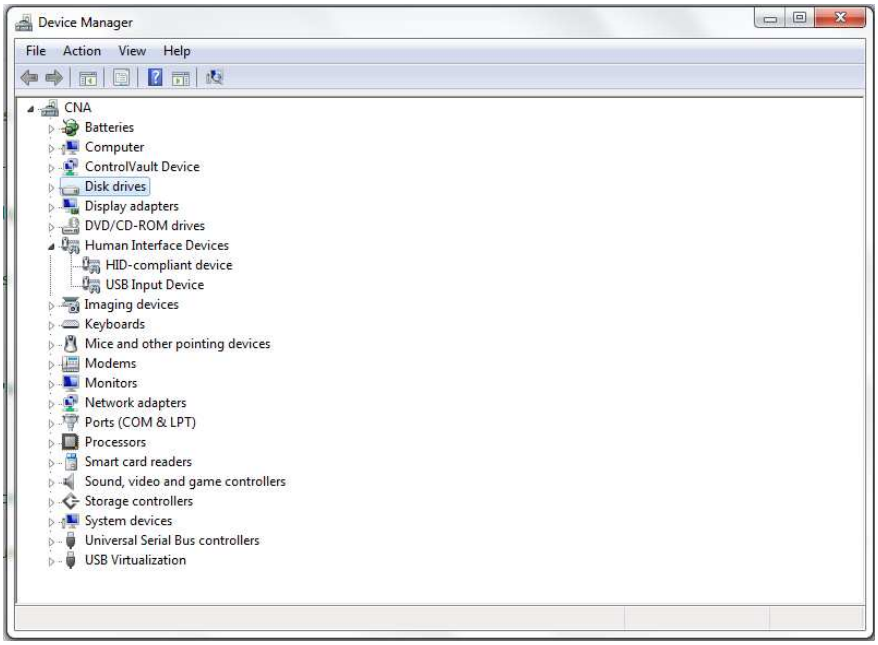


Figure 1-19. Windows 7, ALP USB Driver

The software should start with only “DS90UH947” in the “Devices” pull down menu. If there are more devices then the software is most likely in demo mode. When the ALP is operating in demo mode there is a “(Demo Mode)” indication in the lower left of the application status bar as shown below.

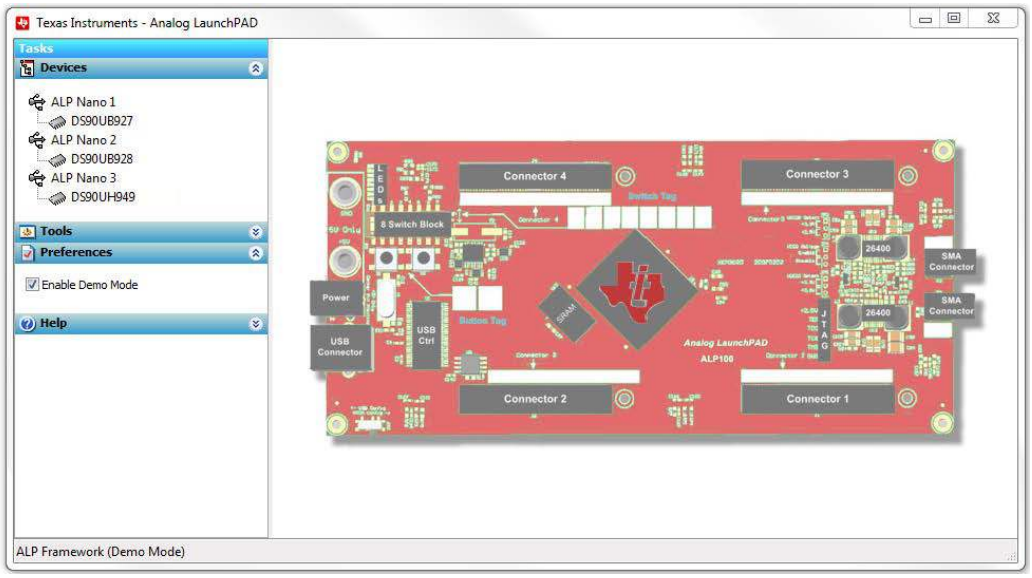


Figure 1-20. ALP in Demo Mode

Disable the demo mode by selecting the “Preferences” pull down menu and un-checking “Enable Demo Mode”.

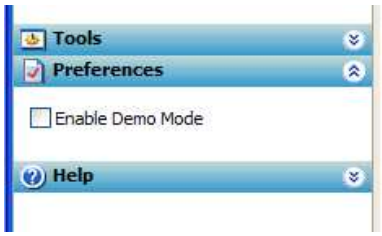


Figure 1-21. ALP Preferences Menu

After demo mode is disabled, the ALP software will poll the ALP hardware. The ALP software will update and have only “DS90UH947” under the “Devices” pull down menu.

1.13 Typical Connection and Test Equipment

The following is a list of typical test equipment that may be used to generate signals for the Serializer inputs:

1. Digital Video Source – for generation of specific display timing such as Digital Video Processor or Graphics Controller (GPU) with HDMI or OpenLDI output.
2. Any other signal generator / video source - This video generator may be used for video signal sources for DVI or DP++
3. Any other signal / video generator that provides the correct input levels as specified in the datasheet.

The picture below shows a typical test set up using a Graphics Controller and display.

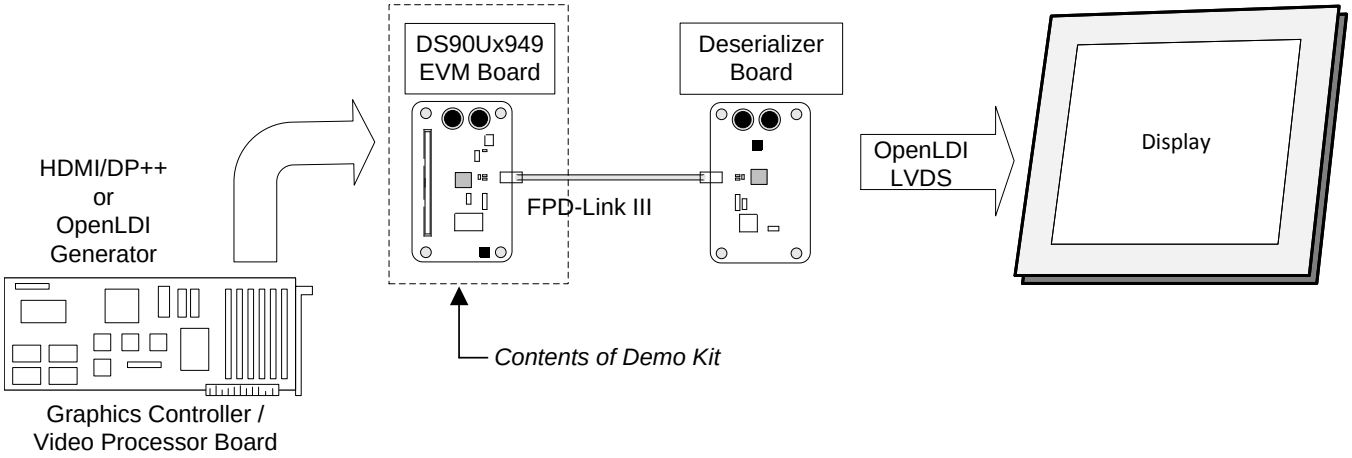


Figure 1-22. Typical Test Setup for Video Application

The picture below shows a typical test set up using a video generator and logic analyzer.

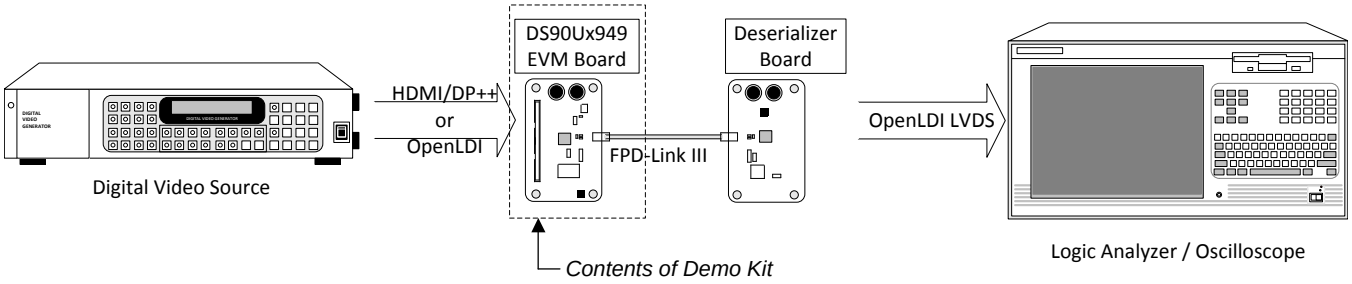


Figure 1-23. Typical Test Setup for Evaluation

1.14 Equipment References

NOTE: Please note that the following references are supplied only as a courtesy to our valued customers. It is not intended to be an endorsement of any particular equipment or supplier.

Digital Video Pattern Generator:

Astrodesign

www.astro-americas.com

Logic Analyzer:

keysight Technologies

www.keysight.com

Corelis CAS-1000-I2C/E I2C Bus Analyzer and Exerciser Products:

www.corelis.com/products/I2C-Analyzer.htm

Aardvark I2C/SPI Host Adapter Part Number: TP240141

www.totalphase.com/products/aardvark_i2cspi

1.15 Cable References

For optimal performance, we recommend Shielded Twisted Pair (STP) 100ohm differential impedance and 24 AWG (or larger diameter) cable for high-speed data applications.

Leoni Dacar 538 series cable:

www.leoni-automotive-cables.com

Rosenberger HSD connector:

www.rosenberger.de/en/Products/35_Automotive_HSD.php

Bill of Materials

Table 2-1. Bill of Materials

Designator	Description	Part Number	Manufacturer	Package Reference	Qty
PCB1	Printed Circuit Board	SV600978	Any		1
C1, C9, C128	CAP, CERM, 0.01 µF, 100 V, +/- 5%, X7R, 0603	06031C103JAT2A	AVX	0603	3
C2, C5, C6, C10, C11, C13, C83, C93, C106, C116, C123, C133, C137	CAP, CERM, 10 µF, 10 V, +/- 10%, X7R, 0805	GRM21BR71A106KE51L	MuRata	0805	13
C3, C7, C12, C14, C81, C82, C84, C85, C89, C94, C95, C96, C97, C98, C104, C105, C107, C108, C110, C111, C113, C117, C121, C122, C126, C129, C131, C132, C135, C136	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0402	GRM155R71C104KA88D	MuRata	0402	30
C4, C8	CAP, TA, 1 µF, 16 V, +/- 10%, 9.3 ohm, SMD	293D105X9016A2TE3	Vishay-Sprague	3216-18	2
C15, C25, C32, C39, C50, C56, C120, C127, C130, C134	CAP, CERM, 4.7 µF, 16 V, +/- 10%, X7R, 0805	GRM21BR71C475KA73L	MuRata	0805	10
C16, C18, C19, C26, C27, C44, C45, C46, C49, C53, C59, C60, C61, C62, C65	CAP, CERM, 0.01 µF, 100 V, +/- 10%, X7R, 0603	06031C103KAT2A	AVX	0603	15
C20, C29, C34, C35, C47, C63	CAP, CERM, 0.1 µF, 25 V, +/- 10%, X7R, 0603	06033C104KAT2A	AVX	0603	6
C21, C28, C33, C38, C42, C64	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0603	C0603C105K4PACTU	Kemet	0603	6
C24, C30, C40, C57	CAP, CERM, 10 µF, 10 V, +/- 10%, X5R, 0805	C0805C106K8PACTU	Kemet	0805	4
C73, C74, C76, C78	CAP, CERM, 0.1 µF, 50 V, +/- 10%, C0G/NP0, 0402	C1005X7R1H104K	TDK	0402	4
C77	CAP, CERM, 0.012 µF, 16 V, +/- 10%, X7R, 0402	GRM155R71C123KA01D	MuRata	0402	1
C87, C88, C90, C91, C92	CAP, CERM, 4.7 pF, 25 V, +/- 5%, C0G/NP0, 0402	GRM1555C1E4R7CA01D	MuRata	0402	5
C99, C103	CAP, CERM, 220 pF, 50 V, +/- 1%, C0G/NP0, 0603	06035A221FAT2A	AVX	0603	2
C100, C101	CAP, CERM, 30 pF, 100 V, +/- 5%, C0G/NP0, 0603	GRM1885C2A300JA01D	MuRata	0603	2
C102	CAP, CERM, 2200 pF, 50 V, +/- 10%, X7R, 0603	C0603X222K5RACTU	Kemet	0603	1
C109	CAP, CERM, 0.47 µF, 16 V, +/- 10%, X7R, 0603	GRM188R71C474KA88D	MuRata	0603	1
C112	CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0, 0402	GRM1555C1H100JA01D	MuRata	0402	1
C114	CAP, TA, 100 µF, 16 V, +/- 20%, 0.1 ohm, SMD	T495D107M016ATE100	Kemet	7343-31	1
C115	CAP, CERM, 47 µF, 16 V, +/- 20%, X5R, 1210	GRM32ER61C476ME15L	MuRata	1210	1

Table 2-1. Bill of Materials (continued)

Designator	Description	Part Number	Manufacturer	Package Reference	Qty
C118	CAP, CERM, 3300 pF, 50 V, +/- 10%, X7R, 0402	GRM155R71H332KA01D	MuRata	0402	1
C119	CAP, CERM, 1 µF, 16 V, +/- 10%, X7R, 0603	C1608X7R1C105K	TDK	0603	1
C124	CAP, TA, 22 µF, 25 V, +/- 20%, 0.7 ohm, SMD	293D226X0025D2TE3	Vishay-Sprague	7343-31	1
C125	CAP, TA, 2.2 µF, 25 V, +/- 10%, 6.3 ohm, SMD	293D225X9025A2TE3	Vishay-Sprague	3216-18	1
D1, D2, D4	LED, Green, SMD	LTST-C190GKT	Lite-On	1.6x0.8x0.8 mm	3
D3	LED, Orange, SMD	LTST-C190KFKT	Lite-On	1.6x0.8x0.8 mm	1
D8	Diode, Schottky, 40 V, 1 A, SOD-123	1N5819HW-7-F	Diodes Inc.	SOD-123	1
F1	Fuse, SC Protector, 12A	429007	Littlefuse	1206	1
FID1, FID2, FID3	Fiducial mark. There is nothing to buy or mount.	N/A	N/A	Fiducial	3
H1, H2, H5, H6	Standoff, Hex, 0.5"L #4-40 Nylon	1902C	Keystone	Standoff	4
J1	Audio Jack, 3.5mm, Stereo, R/A, SMT	SJ-3523-SMT	CUI Inc.	Audio Jack SMD	1
J2, J4, J5, J6, J7, J8, J15, J16, J17, J19, J22, J26, J27, J30, J32, J34, J35, J39, J42, J43, J44	Header, 100mil, 2x1, Gold, TH	5-146261-1	TE Connectivity	Header, 2x1, 100mil	21
J3, J14, J18, J33, J37, J40, J41	Header, 100mil, 3x1, Gold, TH	TSW-103-07-G-S	Samtec	3x1 Header	7
J9, J11, J12, J13	Connector, End launch SMA, 50 ohm, SMT	142-0701-851	Emerson Network Power	SMA End Launch	4
J10	Connector, HDMI, 19-Pos Recept, SMT	1747981-1	TE Connectivity	15.0x6.08x1 1.55mm	1
J20, J24	Header (friction lock), 100mil, 4x1, Gold, TH	0022112042	Molex	Header 4x1 keyed	2
J21	Header, 100mil, 16x2, Gold, TH	TSW-116-07-G-D	Samtec	16x2 Header	1
J23	Header, 100mil, 8x2, Gold, TH	TSW-108-07-G-D	Samtec	8x2 Header	1
J25	Header, 100mil, 4x1, Gold, TH	TSW-104-07-G-S	Samtec	4x1 Header	1
J28	Header (shrouded), 100 mil, 7x2, Gold, TH	SBH11-PBPC-D07-ST-BK	Sullins Connector Solutions	7x2 Shrouded Header	1
J29	Connector, Receptacle, Mini-USB Type B, R/A, Top Mount SMT	1734035-2	TE Connectivity	USB Mini Type B	1
J31	Header, 100mil, 7x2, Tin, TH	PEC07DAAN	Sullins Connector Solutions	Header, 7x2, 100mil, Tin	1
J36	Connector, DC Jack 2.1X5.5 mm, TH	PJ-102A	CUI Inc.	POWER JACK, 14.4x11x9mm	1
J38	Header, 100mil, 4x2, Gold, TH	TSW-104-07-G-D	Samtec	4x2 Header	1
L1, L2, L12, L13	1.5A Ferrite Bead, 330 ohm @ 100MHz, SMD	BLM18SG331TN1D	MuRata	0603	4

Table 2-1. Bill of Materials (continued)

Designator	Description	Part Number	Manufacturer	Package Reference	Qty
L3, L5	Ferrite Bead, 1000 ohm @ 100 MHz, 0.5 A, 0805	BLM21AG102SN1D	Murata	0805	2
L4, L6, L8	Ferrite Bead, 120 ohm @ 100 MHz, 3 A, 0603	BLM18SG121TN1D	MuRata	0603	3
L7	Ferrite Bead, 1000 ohm @ 100 MHz, 0.3 A, 0805	BLM21AG102SN1D	Murata	0805	1
L10, L11	Coupled inductor, 0.22 A, 0.59 ohm, SMD	DLW21SN261XQ2L	MuRata	Inductor, 1.2x1.2x2.0 mm	2
L14	Inductor, Shielded Drum Core, Ferrite, 4.7uH, 4.2A, 0.02 ohm, SMD	7440650047	Wurth Elektronik eiSos	WE-TPC-XLH2	1
P1	Right Angle Plug for PCB, TH	D4S20G-400A5-Z	Rosenberger	HSD connector, Waterblue	1
Q1, Q2, Q3, Q4	MOSFET, N-CH, 50 V, 0.22 A, SOT-23	BSS138	Fairchild Semiconductor	SOT-23	4
R1, R2	RES, 100, 1%, 0.063 W, 0402	CRCW0402100RFKED	Vishay-Dale	0402	2
R3, R7, R9, R10, R11, R12, R13, R14, R15, R16, R21, R22, R23, R25, R26, R28, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R106, R107, R108, R110, R113, R115, R117, R119, R120, R121, R125, R126, R127, R128, R129, R132, R133, R134, R135, R136, R137, R138, R139, R141, R142, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155, R156, R157, R158, R159, R160, R161, R162, R163, R198, R203, R206	RES, 0, 5%, 0.063 W, 0402	ERJ-2GE0R00X	Panasonic	0402	77
R4, R5, R6, R8, R103, R116, R122, R164, R165, R166, R167, R168, R169, R170, R171, R181, R184, R194	RES, 10.0 k, 1%, 0.063 W, 0402	CRCW040210K0FKED	Vishay-Dale	0402	18
R17	RES, 49.9, 1%, 0.063 W, 0402	CRCW040249R9FKED	Vishay-Dale	0402	1
R19	RES, 4.70 k, 1%, 0.1 W, 0402	ERJ-2RKF4701X	Panasonic	0402	1
R27, R123, R124	RES, 4.7 k, 5%, 0.063 W, 0402	CRCW04024K70JNED	Vishay-Dale	0402	3
R49, R58, R85	RES, 118 k, 1%, 0.063 W, 0402	CRCW0402118KFKED	Vishay-Dale	0402	3
R50, R59, R86	RES, 107 k, 1%, 0.063 W, 0402	CRCW0402107KFKED	Vishay-Dale	0402	3
R51, R60, R87	RES, 113 k, 1%, 0.063 W, 0402	CRCW0402113KFKED	Vishay-Dale	0402	3
R52, R61, R88	RES, 82.5 k, 1%, 0.063 W, 0402	CRCW040282K5FKED	Vishay-Dale	0402	3
R53, R62, R89	RES, 68.1 k, 1%, 0.063 W, 0402	CRCW040268K1FKED	Vishay-Dale	0402	3
R54, R63, R90	RES, 56.2 k, 1%, 0.063 W, 0402	CRCW040256K2FKED	Vishay-Dale	0402	3

Table 2-1. Bill of Materials (continued)

Designator	Description	Part Number	Manufacturer	Package Reference	Qty
R55, R64, R91	RES, 13.3 k, 1%, 0.063 W, 0402	CRCW040213K3FKED	Vishay-Dale	0402	3
R66, R75, R93	RES, 40.2 k, 1%, 0.063 W, 0402	CRCW040240K2FKED	Vishay-Dale	0402	3
R67, R76, R94	RES, 30.9 k, 1%, 0.063 W, 0402	CRCW040230K9FKED	Vishay-Dale	0402	3
R68, R77, R95	RES, 51.1 k, 1%, 0.063 W, 0402	CRCW040251K1FKED	Vishay-Dale	0402	3
R69, R78, R96	RES, 88.7 k, 1%, 0.063 W, 0402	CRCW040288K7FKED	Vishay-Dale	0402	3
R70, R79, R97	RES, 102 k, 1%, 0.063 W, 0402	CRCW0402102KFKED	Vishay-Dale	0402	3
R71, R80, R98	RES, 137 k, 1%, 0.063 W, 0402	CRCW0402137KFKED	Vishay-Dale	0402	3
R72, R81, R99	RES, 210 k, 1%, 0.063 W, 0402	CRCW0402210KFKED	Vishay-Dale	0402	3
R102	RES, 1.00 k, 1%, 0.1 W, 0402	ERJ-2RKF1001X	Panasonic	0402	1
R111	RES, 1.0 k, 5%, 0.063 W, 0402	CRCW04021K00JNED	Vishay-Dale	0402	1
R130, R131	RES, 47 k, 5%, 0.063 W, 0402	CRCW040247K0JNED	Vishay-Dale	0402	2
R140	RES, 27 k, 5%, 0.063 W, 0402	CRCW040227K0JNED	Vishay-Dale	0402	1
R172	RES, 330, 5%, 0.063 W, 0402	CRCW0402330RJNED	Vishay-Dale	0402	1
R173, R174, R175	RES, 470, 5%, 0.063 W, 0402	CRCW0402470RJNED	Vishay-Dale	0402	3
R176, R177	RES, 33, 5%, 0.063 W, 0402	CRCW040233R0JNED	Vishay-Dale	0402	2
R178, R185, R186	RES, 1.5 k, 5%, 0.063 W, 0402	CRCW04021K50JNED	Vishay-Dale	0402	3
R179, R182	RES, 33 k, 5%, 0.063 W, 0402	CRCW040233K0JNED	Vishay-Dale	0402	2
R180	RES, 1.2 M, 5%, 0.1 W, 0603	CRCW06031M20JNEA	Vishay-Dale	0603	1
R183	RES, 200, 5%, 0.063 W, 0402	CRCW0402200RJNED	Vishay-Dale	0402	1
R187	RES, 124 k, 1%, 0.063 W, 0402	CRCW0402124KFKED	Vishay-Dale	0402	1
R188	RES, 22.1 k, 1%, 0.063 W, 0402	CRCW040222K1FKED	Vishay-Dale	0402	1
R189, R195, R204, R207	RES, 0, 5%, 0.1 W, 0603	CRCW06030000Z0EA	Vishay-Dale	0603	4
R193, R196, R200, R205	RES, 100 k, 5%, 0.063 W, 0402	CRCW0402100KJNED	Vishay-Dale	0402	4
R197	RES, 1.87 k, 1%, 0.063 W, 0402	CRCW04021K87FKED	Vishay-Dale	0402	1
R199	RES, 4.99 k, 1%, 0.063 W, 0402	CRCW04024K99FKED	Vishay-Dale	0402	1
R201	RES, 23.2 k, 1%, 0.063 W, 0402	CRCW040223K2FKED	Vishay-Dale	0402	1
R202	RES, 12.1 k, 1%, 0.063 W, 0402	CRCW040212K1FKED	Vishay-Dale	0402	1
R208	RES, 3.24 k, 1%, 0.063 W, 0402	CRCW04023K24FKED	Vishay-Dale	0402	1

Table 2-1. Bill of Materials (continued)

Designator	Description	Part Number	Manufacturer	Package Reference	Qty
S1	Switch, Slide, SPST 3 poles, SMT	219-3LPST	CTS Electrocomponents	3 poles SPST Switch	1
S2, S3, S6	Switch, Slide, SPST 8 poles, SMT	219-8MST	CTS Electrocomponents	Switch, 8Pos, 21.8x3.8x6.7 mm	3
S4, S7, S9	SWITCH TACTILE SPST-NO 0.02A 15V, TH	EVQ-PAD04M	Panasonic	6x4.3x6mm	3
S5	DIP Switch, 4 position slide actuator, SPST, SMD	A6S-4104-H	Omron Electronic Components	SMT DIP switch	1
SH-J3, SH-J14, SH-J17, SH-J18, SH-J22, SH-J33, SH-J37, SH-J40, SH-J41	Shunt, 2mm, Gold plated, Black	2SN-BK-G	Samtec	2mm Shunt, Closed Top	9
U1	SINGLE-ENDED, ANALOG-INPUT 24-BIT, 96-kHz STEREO A/D CONVERTER, PW0014A	PCM1808PWR	Texas Instruments	PW0014A	1
U2	1080p HDMI to FPD-Link III Bridge Serializer, RGC0064K	DS90UH949TRGCRQ1	Texas Instruments	RGC0064K	1
U3	Socket, DIP-8, Sleeve Pin, 2.54 mm Pitch	110-13-308-41-001000	Mill-Max	DIP-8, Body 10.16x10.16 mm, Pitch 2.54mm	1
U4	Socket, 20pin DIP	STD	STD	DIP20	1
U5	ESD-Protection Array for High-Speed Data Interfaces, 4 Channels, -40 to +85 degC, 6-pin SON (DRY), Green (RoHS & no Sb/Br)	TPD4E004DRYRG4	Texas Instruments	DRY0006A	1
U6	Mixed Signal MicroController, PN0080A	MSP430F5529IPN	Texas Instruments	PN0080A	1
U7	TCA9406 Dual Bidirectional 1-MHz I2C-BUS and SMBus Voltage Level-Translator, 1.65 to 3.6 V, -40 to 85 degC, 8-pin US8 (DCU), Green (RoHS & no Sb/Br)	TCA9406DCUR	Texas Instruments	DCU0008A	1
U8	IC, 6-BIT BIDIRECTIONAL VOLTAGE-LEVEL TRANSLATOR	TXB0106PWR	TI	TSSOP	1
U9	IC, 4.5V-18V Input, 2-A Sync. Step-Down SWIFT Converter	TPS54225PWP	TI	PWP20	1
U10	IC, 1.5A LDO Regulator with Soft-Start	TPS74701DRC	TI	SON-10	1
U11	IC, Dual 1-A Low-Dropout Regulator	TPS767D3xxPWP	TI	PWP28	1
Y1	Oscillator,	ECS-8FA3-xxx-TR	ECS	0.551 x 0.386 inch	1
Y3	Crystal, 24.000MHz, 20pF, SMD	ECS-240-20-5PX-TR	ECS Inc.	Crystal, 11.4x4.3x3.8 mm	1
C17, C41, C43, C58	CAP, CERM, 0.047 µF, 16 V, +/- 10%, X7R, 0603	GRM188R71C473KA01D	MuRata	0603	0
C22, C23, C31, C37, C48, C51, C52, C55	CAP, CERM, 4.7 µF, 16 V, +/- 10%, X7R, 0805	GRM21BR71C475KA73L	MuRata	0805	0

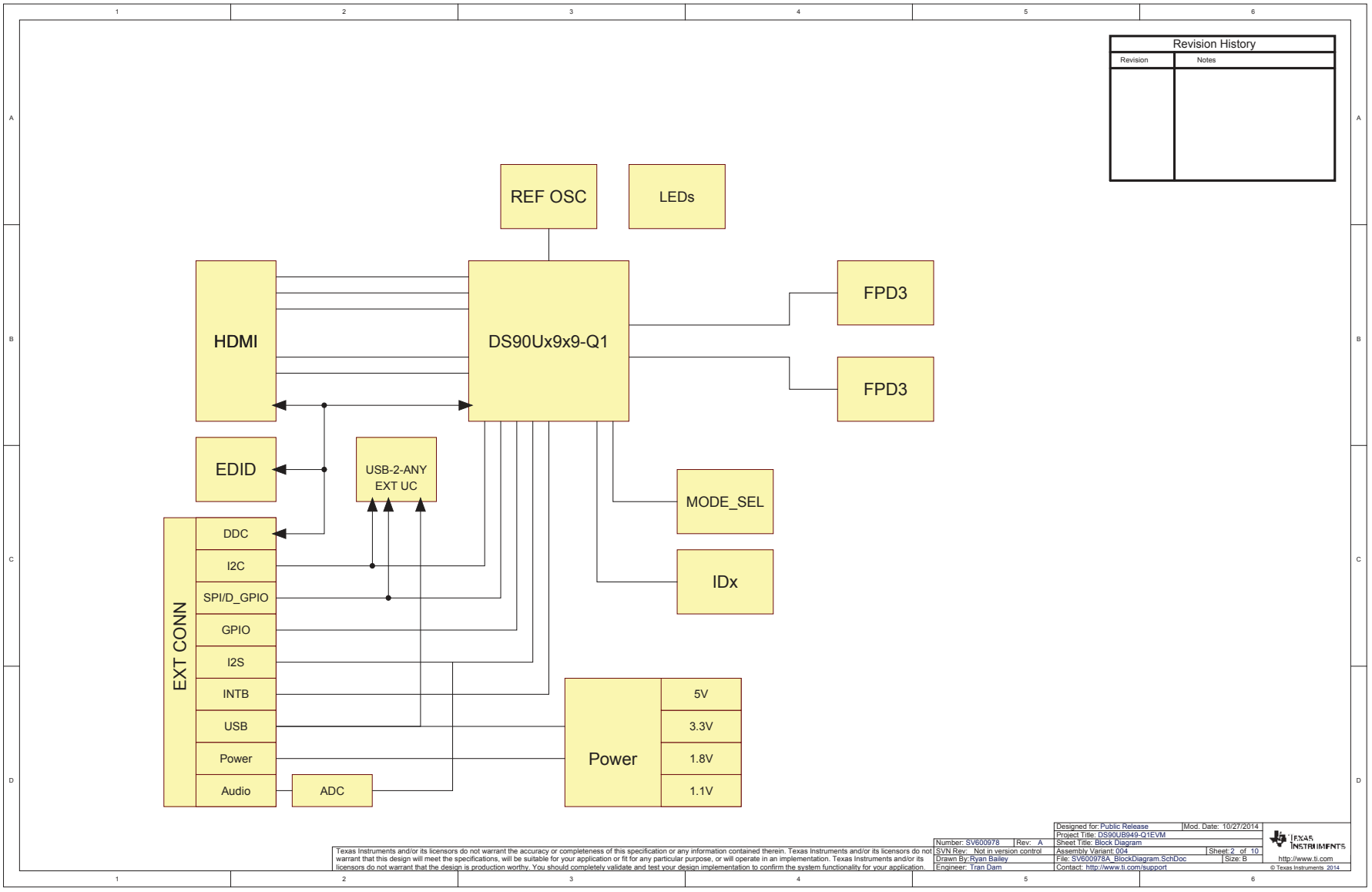
Table 2-1. Bill of Materials (continued)

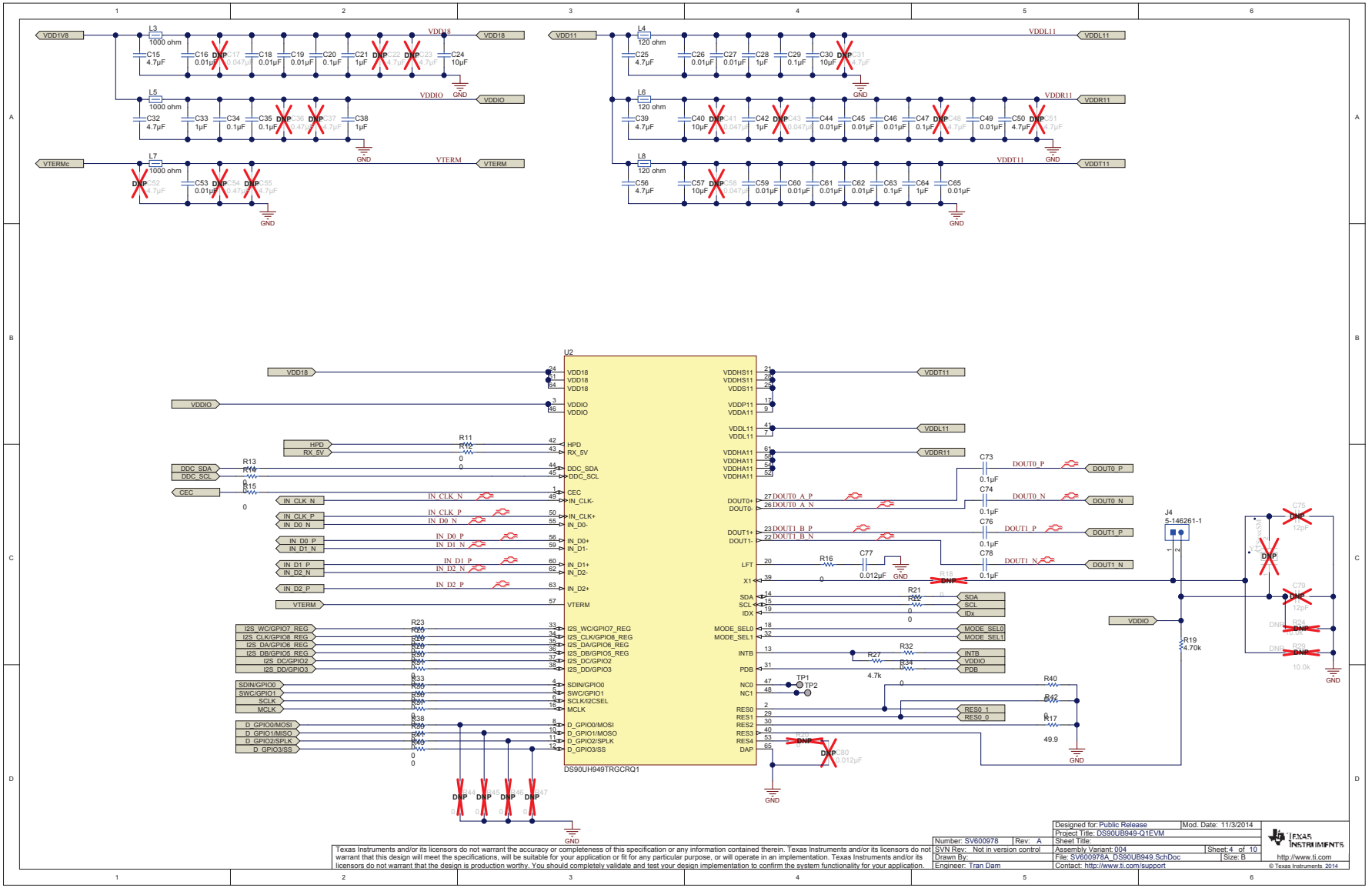
Designator	Description	Part Number	Manufacturer	Package Reference	Qty
C36, C54	CAP, CERM, 0.47 µF, 16 V, +/- 10%, X7R, 0603	GRM188R71C474KA88D	MuRata	0603	0
C75, C79	CAP, CERM, 12 pF, 25 V, +/- 5%, C0G/NP0, 0402	GRM1555C1E120JA01D	MuRata	0402	0
C80	CAP, CERM, 0.012 µF, 16 V, +/- 10%, X7R, 0402	GRM155R71C123KA01D	MuRata	0402	0
C86	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0402	GRM155R71C104KA88D	MuRata	0402	0
R18, R20, R44, R45, R46, R47, R48, R56, R57, R65, R73, R74, R82, R83, R84, R92, R100, R101, R143, R144, R209, R210, R211, R212	RES, 0, 5%, 0.063 W, 0402	ERJ-2GE0R00X	Panasonic	0402	0
R24, R29, R104, R105	RES, 10.0 k, 1%, 0.063 W, 0402	CRCW040210K0FKED	Vishay-Dale	0402	0
R109, R112, R114, R118	RES, 49.9, 1%, 0.063 W, 0402	CRCW040249R9FKED	Vishay-Dale	0402	0
S8	Switch, Slide, SPST 8 poles, SMT	219-8MST	CTS Electrocomponents	Switch, 8Pos, 21.8x3.8x6.7 mm	0
Y2	Crystal, SMT Quart Crystal	ATSxxxSM	CTS	0.484 x 0.190 inch	0
H3, H4, H7, H8	Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	NY PMS 440 0025 PH	B&F Fastener Supply	Screw	4

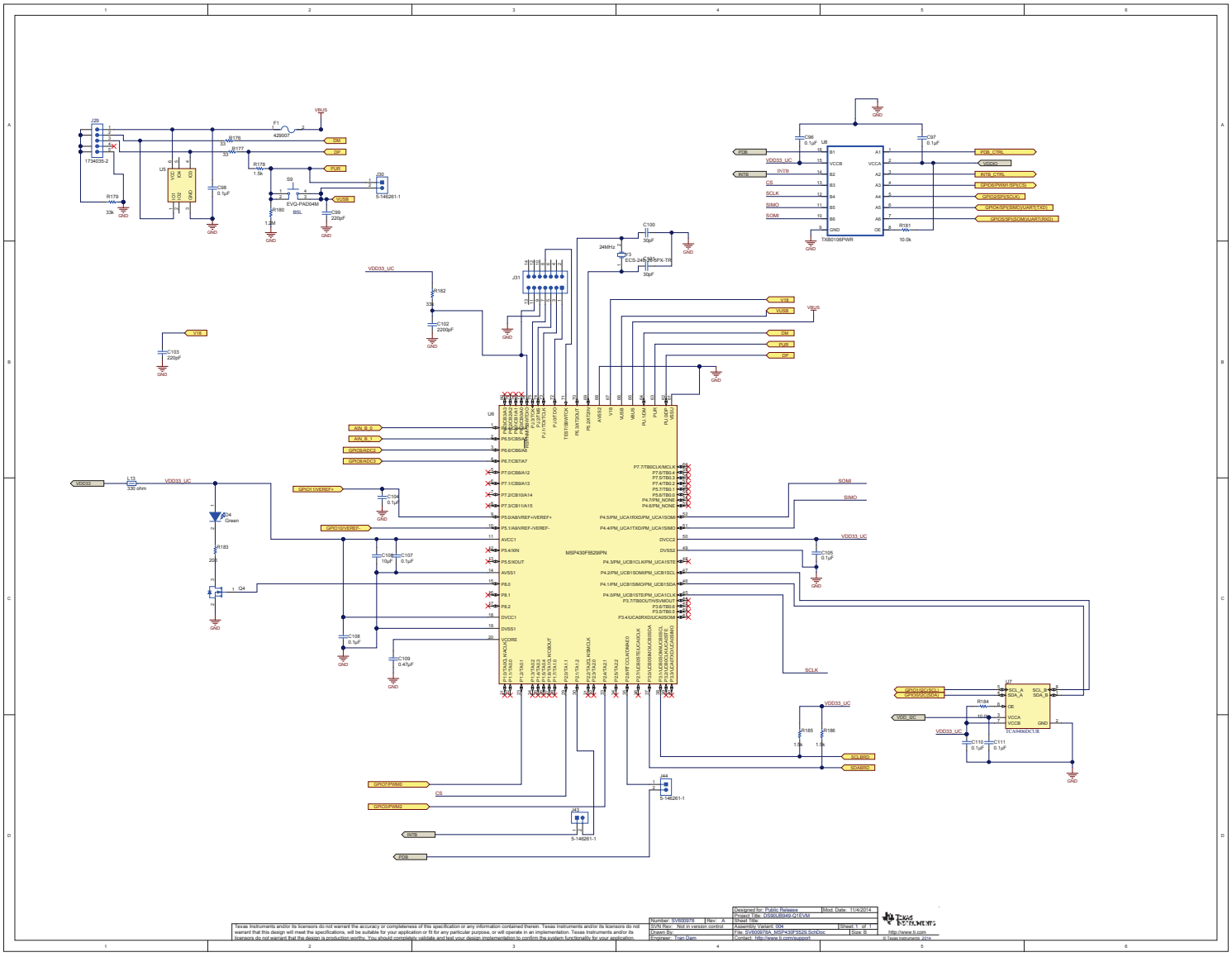
Appendix A

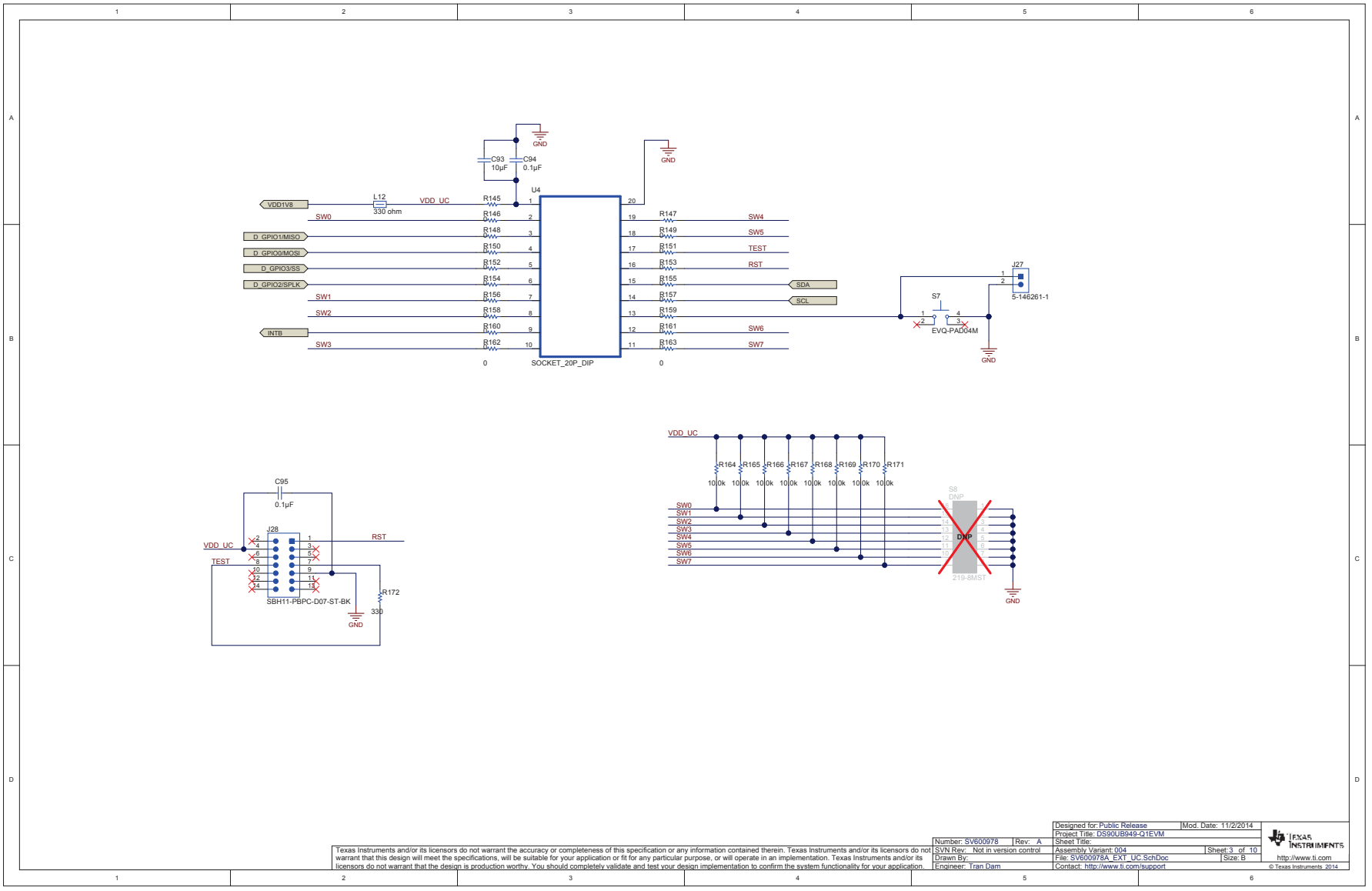
SNLU169–December 2014

EVM PCB Schematics



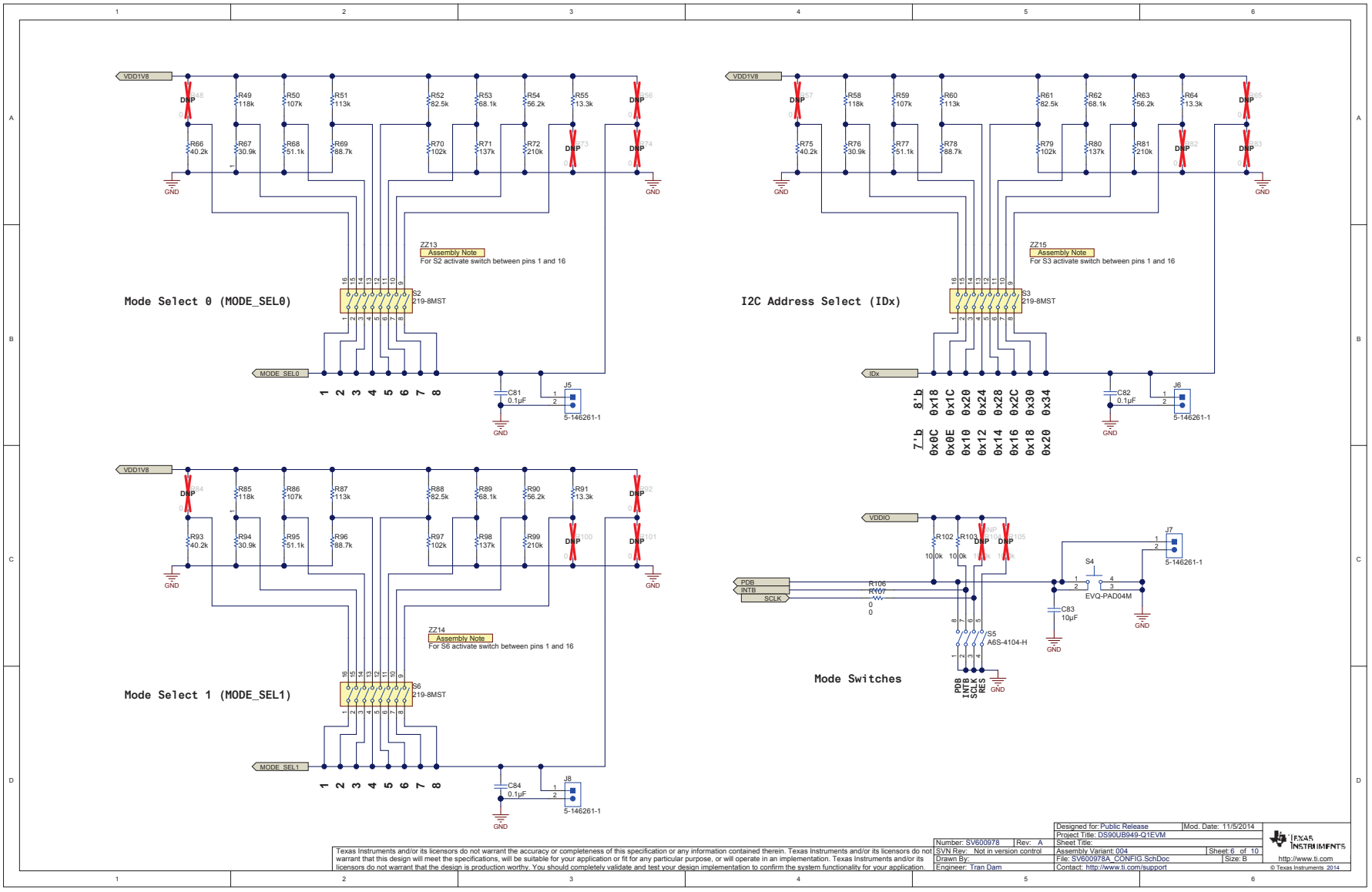


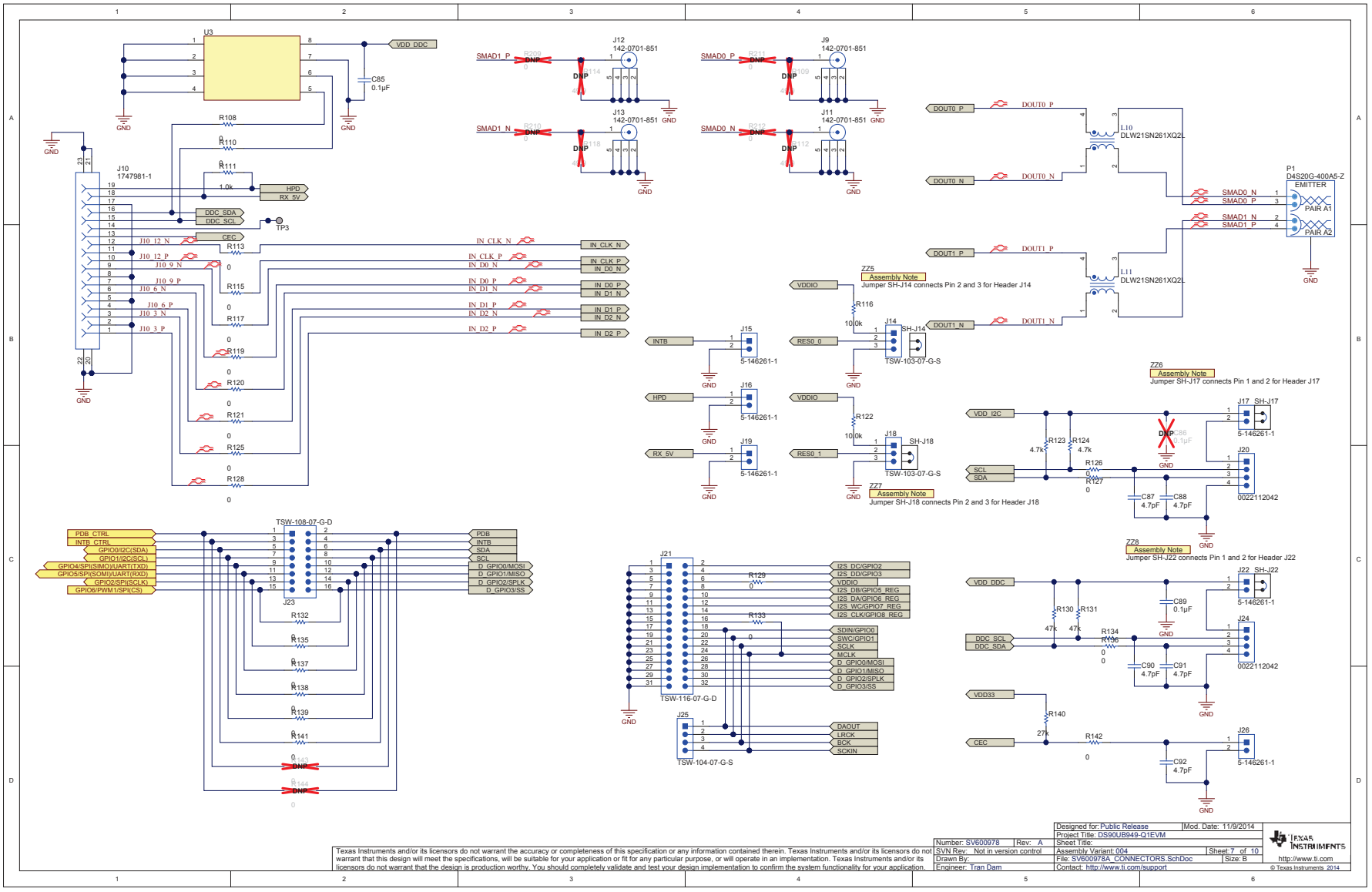


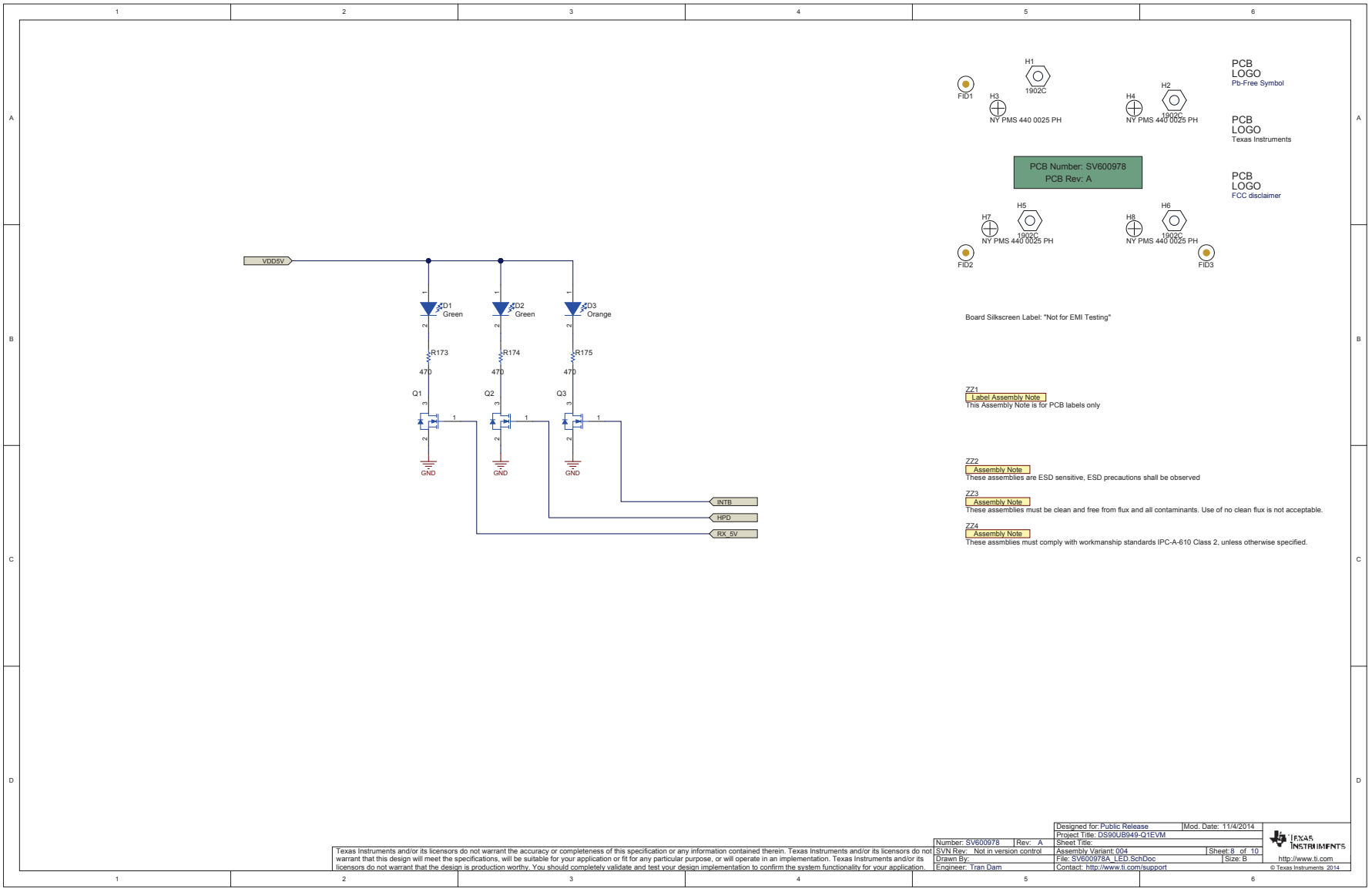


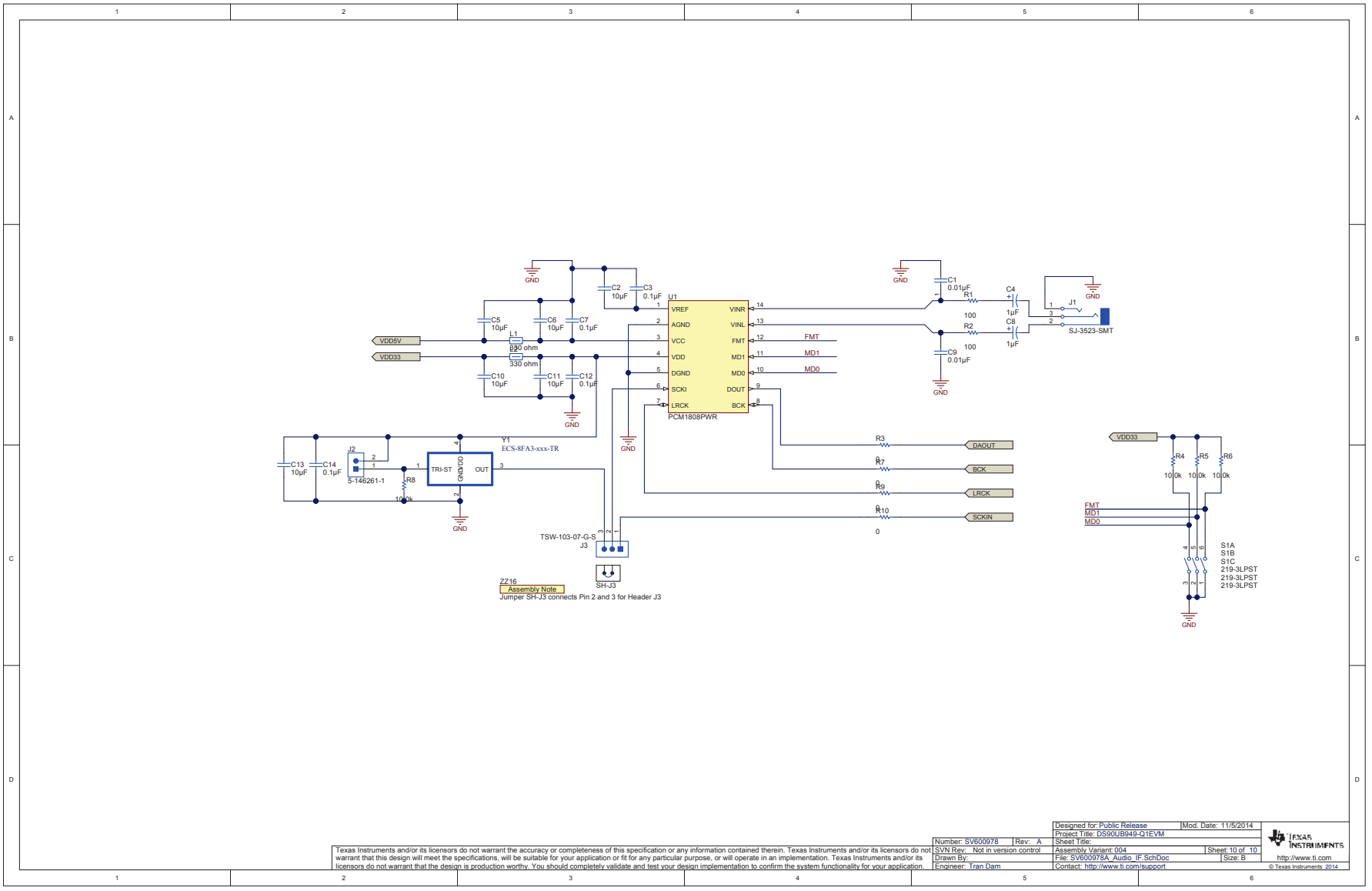
Designed for: Public Release	Mod. Date: 11/2/2014
Project Title: DS90UB949-Q1EVM	
Number: SV600978 Rev: A	Sheet Title:
SVN Rev: Not in version control	Assembly Variant: 004 Sheet: 3 of 10
Drawn By:	File: SV600978A_EXT_UC.SchDoc Size: B
Engineer: Tran Dam	Contact: http://www.ti.com/support

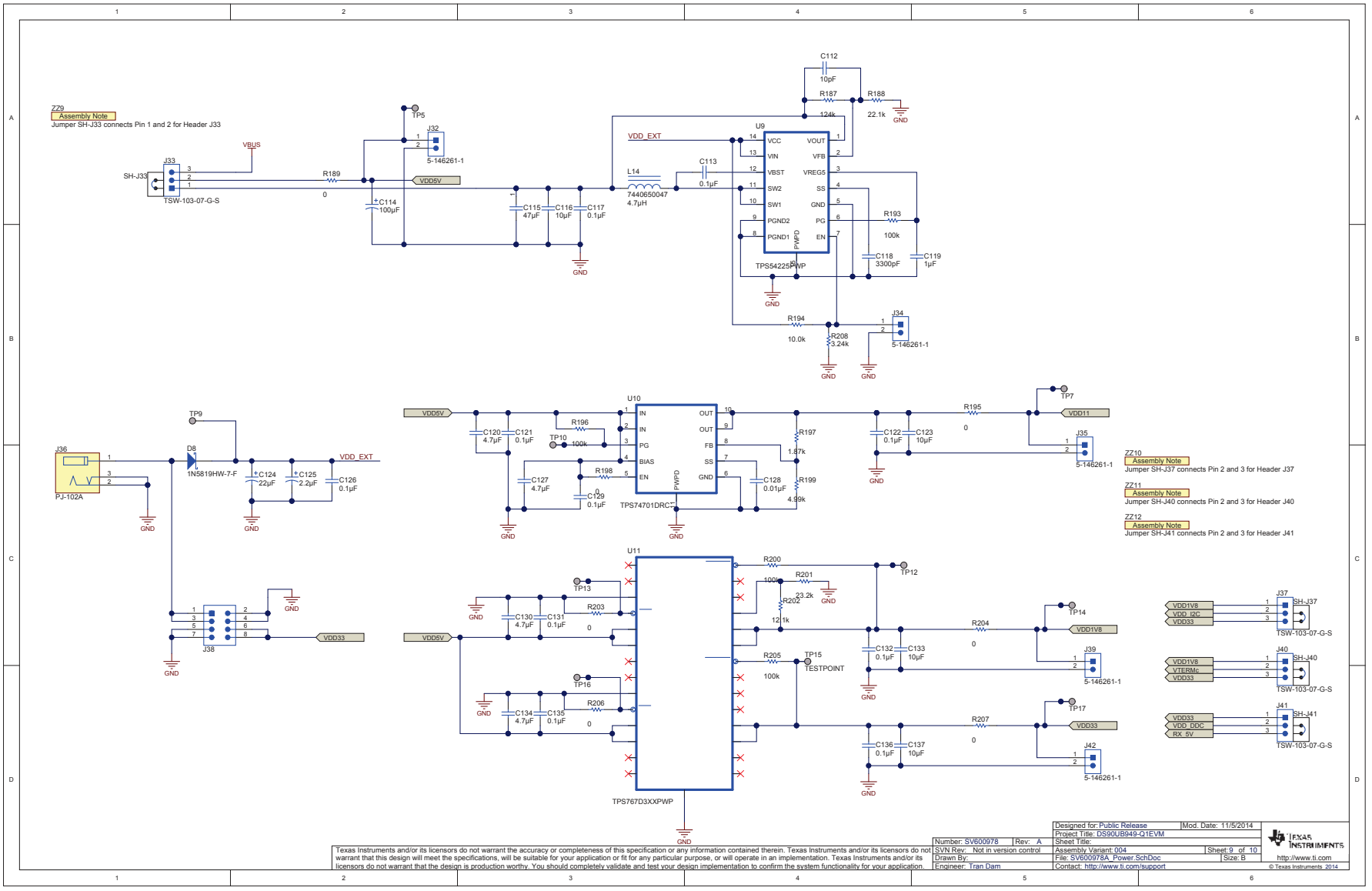
http://www.ti.com





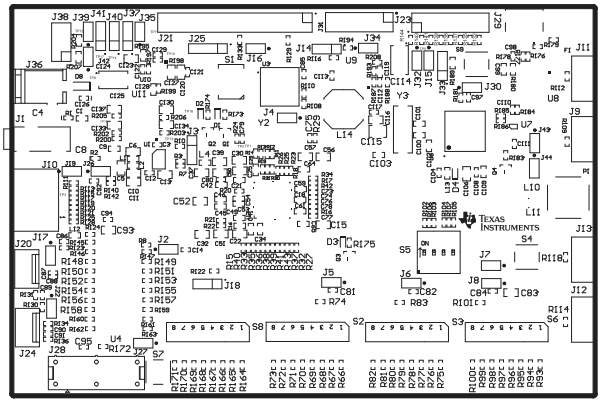




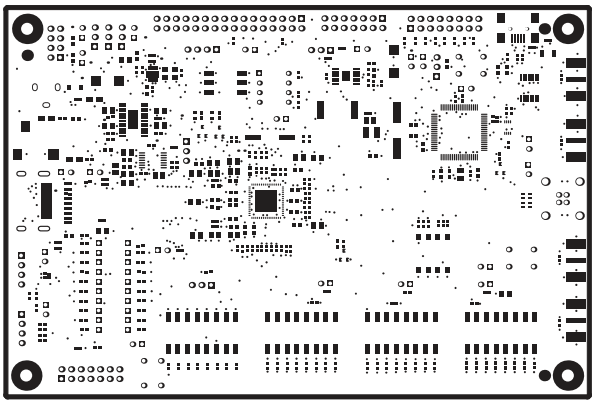


Board Layout

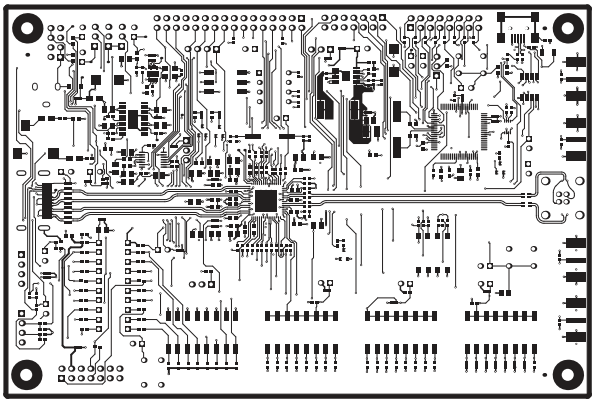
Board Layers



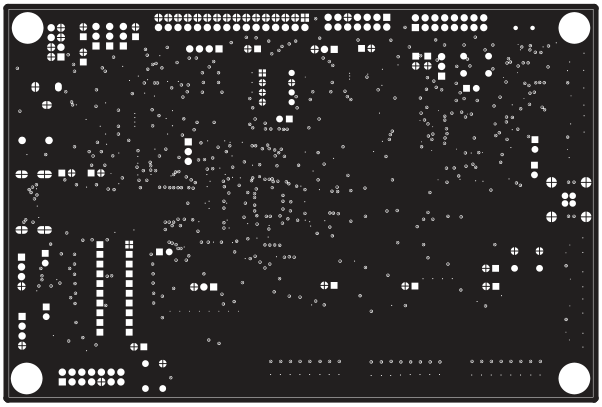
ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = Top Overlay			
PLOT NAME = Top Overlay	GENERATED : 11/10/2014 1:14:44 AM		TEXAS INSTRUMENTS



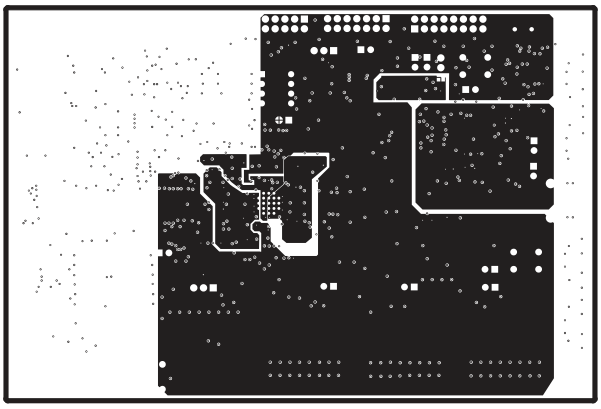
ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = Top Solder			
PLOT NAME = Top Solder Mask	GENERATED : 11/10/2014 1:14:45 AM		TEXAS INSTRUMENTS



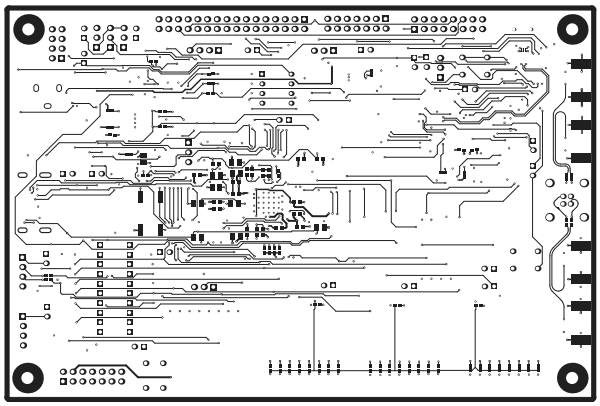
ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = Top Layer			
PLOT NAME = Top Layer	GENERATED : 11/10/2014 1:14:45 AM		TEXAS INSTRUMENTS



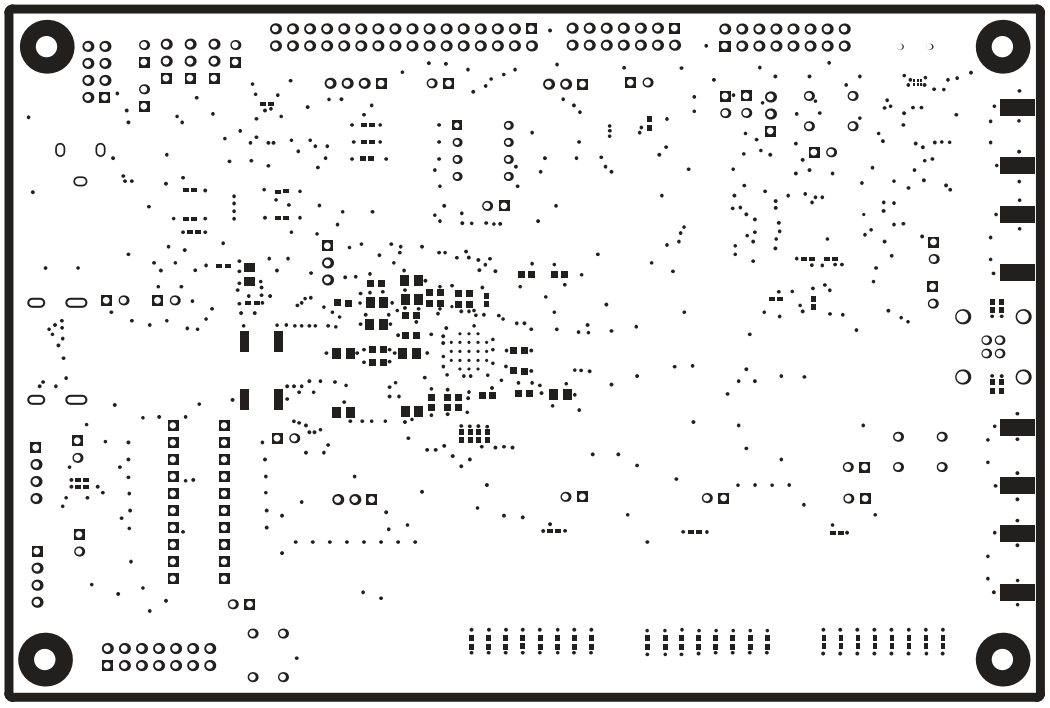
ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = MI Board Outline			
PLOT NAME = MidLayer1	GENERATED : 11/10/2014 1:14:46 AM		TEXAS INSTRUMENTS



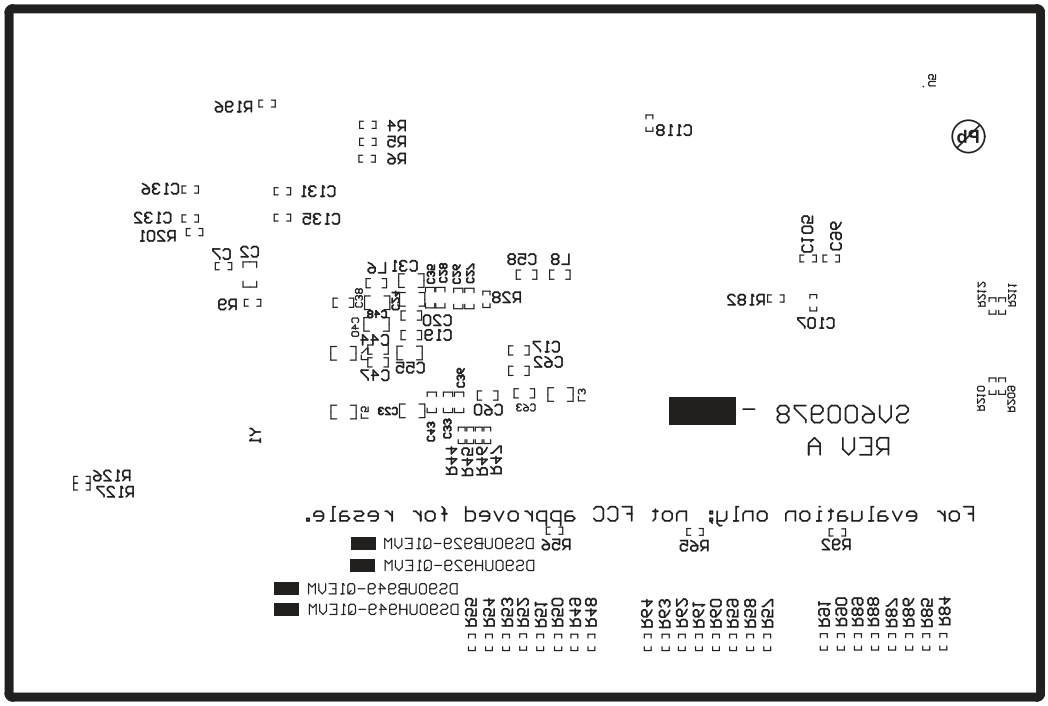
ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = MI Board Outline			
PLOT NAME = MidLayer2	GENERATED : 11/10/2014 1:14:47 AM		TEXAS INSTRUMENTS



ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = Bottom Layer			
PLOT NAME = Bottom Layer	GENERATED : 11/10/2014 1:14:48 AM		TEXAS INSTRUMENTS



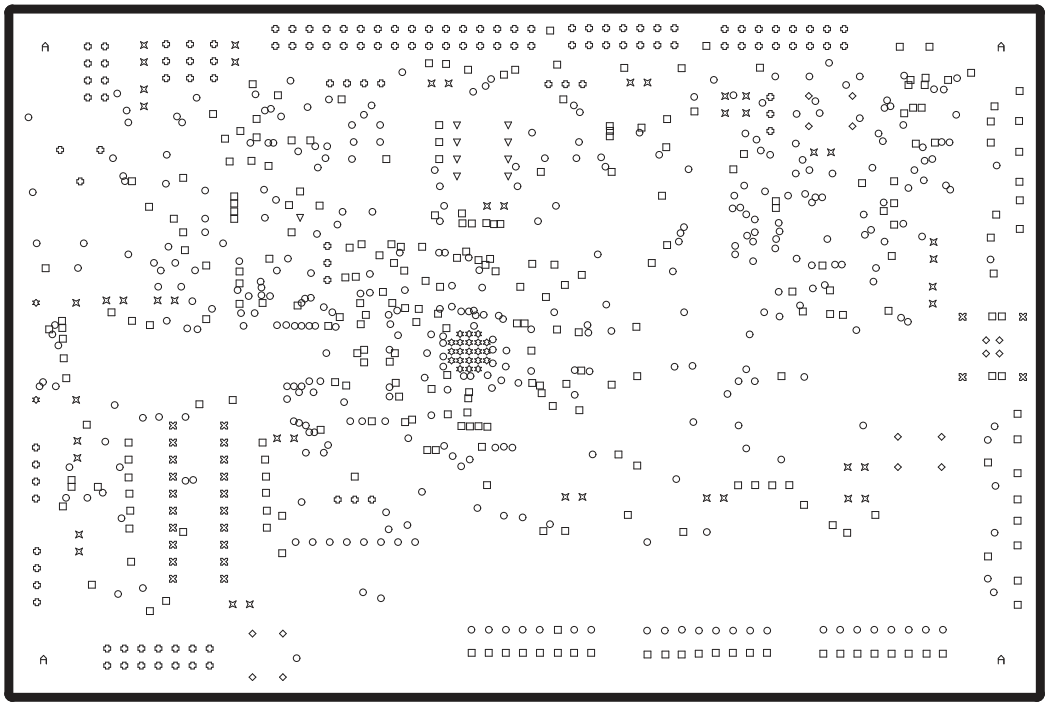
ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = Bottom Solder			
PLOT NAME = Bottom Solder Mask	GENERATED : 11/10/2014 1:14:48 AM		TEXAS INSTRUMENTS



ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = Bottom Overlay			
PLOT NAME = Bottom Overlay	GENERATED : 11/10/2014 1:14:49 AM		TEXAS INSTRUMENTS

Drill Table

Symbol	Hit Count	Finished Hole Size	Plated	Hole Type
⌑	2	35.43mil (0.900mm)	NPTH	Round
◎	2	66.93mil (1.700mm)	NPTH	Round
⌔	4	36.00mil (0.914mm)	PTH	Round
▽	4	125.98mil (3.200mm)	PTH	Round
▽	10	13.00mil (0.330mm)	PTH	Round
⧈	12	42.00mil (1.067mm)	PTH	Round
□	19	8.00mil (0.203mm)	PTH	Round
⊠	42	38.00mil (0.965mm)	PTH	Round
◇	144	40.00mil (1.016mm)	PTH	Round
⌑	261	12.00mil (0.305mm)	PTH	Round
○	423	10.00mil (0.254mm)	PTH	Round
	923 Total			



ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SUN REV: Not In VersionControl
LAYER NAME = Drill Drawing			
PLOT NAME = Drill Drawing	GENERATED : 11/10/2014 1:14:50 AM		TEXAS INSTRUMENTS

ALL ARTWORK VIEWED FROM TOP SIDE	BOARD #: SV600978	REV: A	SVN REV: Not In VersionControl
LAYER NAME = M2 Board Dimensions			
PLOT NAME = Board Dimensions	GENERATED : 11/10/2014 1:14:52 AM	TEXAS INSTRUMENTS	

Revision History

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

DATE	REVISION	NOTES
December 2014	*	Initial release

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.

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1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

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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:*

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

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   6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS AND CONDITIONS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT MADE, CONCEIVED OR ACQUIRED PRIOR TO OR AFTER DELIVERY OF THE EVM.

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8. *Limitations on Damages and Liability:*

   8.1 *General Limitations*. IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS ANDCONDITIONS OR THE USE OF THE EVMS PROVIDED HEREUNDER, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN ONE YEAR AFTER THE RELATED CAUSE OF ACTION HAS OCCURRED.

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9. *Return Policy*. Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

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