DS90UR910QEVM User’s Guide

User's Guide

Literature Number: SNLU143
September 2013

DS90UR910QEVM Evaluation Kit

The DS90UR910QEVM converts FPD-Link II to MIPI CSI-2. This kit will demonstrate the functionality and operation of the DS90UR910Q. The DS90UR910Q is an interface bridge chip that recovers data from the FPD-Link II serial bit stream and converts into a Camera Serial Interface (CSI-2) format compatible with Mobile Industry Processor Interface (MIPI) specifications. It recovers the 24- or 18-bit RGB data and 3 video sync-signals from the serial bit stream compatible to FPD-Link II serializers.

The recovered data is packetized and serialized over two data lanes strobed by a half-rate serial clock compliant with the MIPI DPHY / CSI-2 specifications, each running up to 900 Mbps. The FPD-Link II receiver supports pixel clocks of up to 75 MHz. The CSI-2 output serial bus greatly reduces the interconnect and signal count to a graphic processing unit (GPU) and eases system designs for video streams from multiple automotive driver assist cameras.

NOTE: **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.**

Topic **Page**

1 DS90UR910QEVM

The Texas Instruments DS90UR910QEVM evaluation module (EVM) helps system designers evaluate the operation and performance of the DS90UR910Q 10 - 75 MHz 24-bit Color FPD-Link II to CSI-2 Converter.

1.1 Features

- 10 – 75 MHz PCLK support (280 Mbps – 2.10 Gbps FPD-Link II linerate)
- Compatible to DC balanced, AC coupled for FPD-Link II serial bit stream
- Capable to recover data up to 10 meters STP cable
- MIPI D-PHY modules conform to v1.00.00
- Compatible with MIPI CSI-2 Version 1.01
- Supports data rate up to 900Mbps per data lane, with two lanes
- Video stream packet formats: RGB888
- Continuous and Non-Continuous Clocking Mode
- Ultra low power, escape, high speed, and control modes support
- Integrated input terminations and adjustable receive equalization
- Fast random lock; no reference clock required
- CCI/I^{2}C compatible control bus
- @Speed BIST and reporting pin
- Single +1.8V power supply
- 1.8V or 3.3V compatible LVCMOS I/O interface
- Automotive grade product: AEC-Q100 Grade 2 qualified
- 8 kV ISO 10605 ESD Rating

1.2 Ordering Information

Reference	DEVICE ID	DEVICE PACKAGE
U1	DS90UR910SQE	WQFN40

1.3 System Requirements

In order to demonstrate, the following is required:

1. FPD-Link II compatible Serializer
   - DS90UR905Q, DS90UR241Q, DS90C241Q, DS90UR907Q, DS99R421Q
   - DS90UH/UB/925/927Q FPD-Link III serializers in backward compatibility mode
2. Video source
3. Optional I^{2}C controller
4. Power supply for 1.8V (required) and 3.3V (optional)

1.4 Contents of the Demo Evaluation Kit

- One EVM board with the DS90UR910Q

1.5 Applications Diagram

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

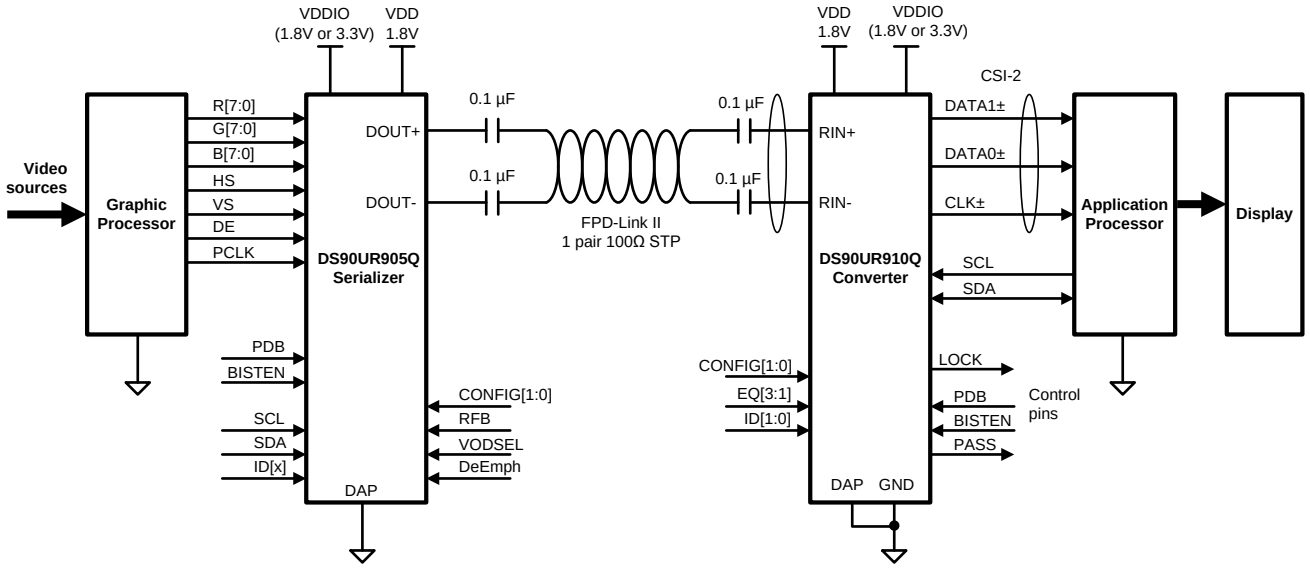


Figure 1. Applications Diagram

1.6 Typical Configuration

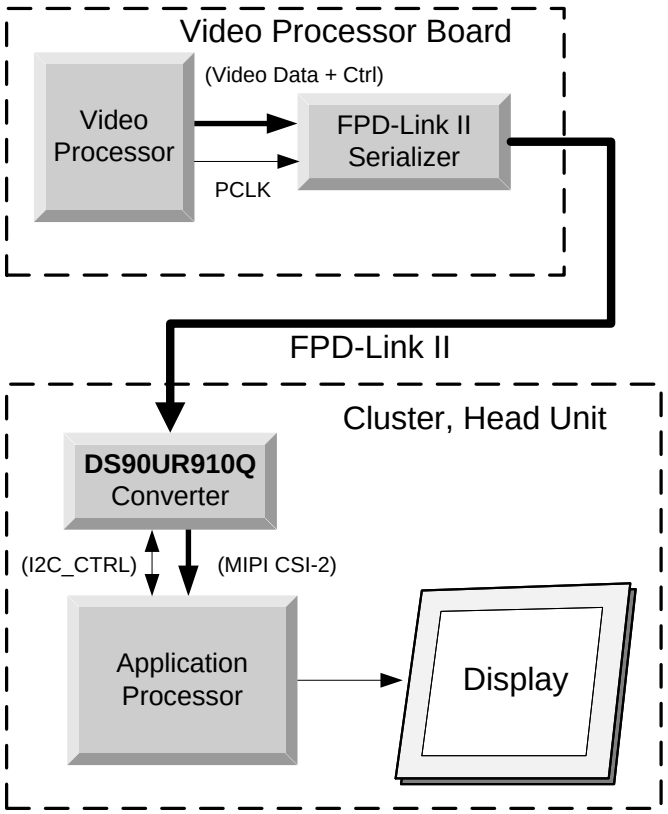


Figure 2. Diagram

2 Quick Start Guide

1. Connect header JP3 to I²C host controller for register programming (optional)
2. Configure switches S1, S2 and S3 to set device's operating modes
3. Connect J1, J2 (RIN+, RIN-) to FPD-Link serial bit stream from an external DS90UR905, DS90Ux925, or compatible FPD-Link II serializer.
4. Connect CSI-2 output signals (J4-8, J10) to GPU
5. Provide power to board on VDD (1.8V), GND (Ground), and VDDIO (1.8V or 3.3V)
   - Optional +5VDC power supply on J11
6. Look for the LED D1 to light up on the board. If the LED is lit and stable, then the DS90UR910Q is LOCKED to the FPD-Link II serial stream. LED D2 will be lit when a valid display timing is detected.
7. For details of pin-names and pin-functions, please refer to the DS90UR910 datasheet

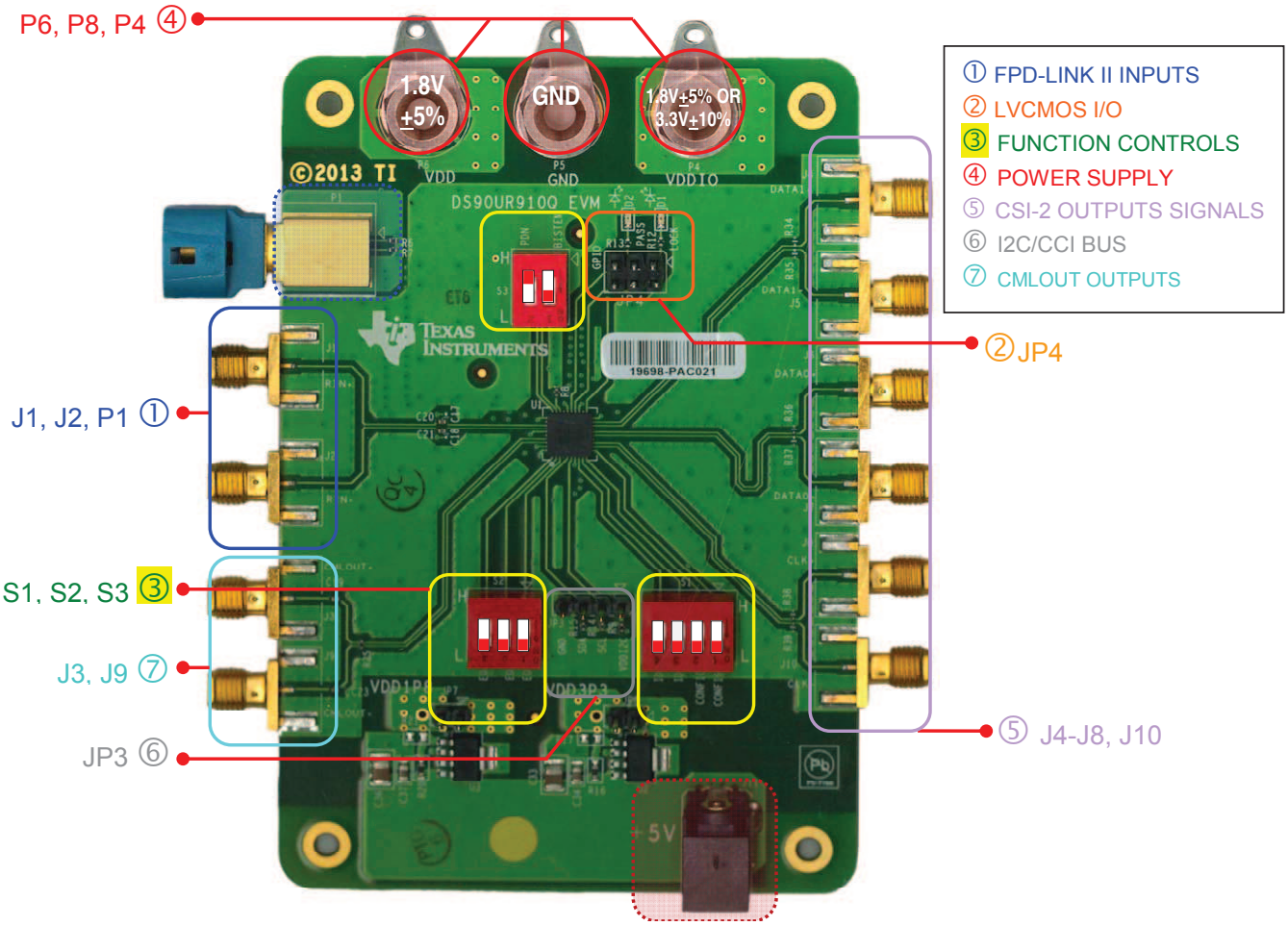


Figure 3. Evaluation Board Connections

2.1 Demo Board Connections

Table 1. Power Supply Connection

Reference	Signal	Description
P4	VDDIO	1.8V ±5% OR 3.3V ±10%
P5	GND	Ground
P6	VDD	1.8V ±5%
J11 (Optional)	+5V	Single main +5V (0.5A) power connector that supplies power to the entire board. Short jumpers JP7 and JP6 for 1.8V and 3.3V on board regulator power supplies respectively.

Table 2. CSI-2 Output Signals

Reference	Signal	Description
J4	DATA1+	Non-inverting data output of DPHY Lane 1
J5	DATA1-	Inverting data output of DPHY Lane 1
J6	DATA0+	Non-inverting data output of DPHY Lane 0
J7	DATA0-	Inverting data output of DPHY Lane 0
J8	CLK+	Non-inverting half-rate DPHY clock lane
J10	CLK-	Inverting half-rate DPHY clock lane

Table 3. FPD-Link II Input Signal

Reference	Signal	Description
J1	RIN+	SMA connector
J2	RIN-	SMA connector
P1 (Optional)	RIN+/-	HSD connector Populate C17 and C18 to use P1 connector.

Table 4. I^2C/CCI Interface Header

Reference	Signal	Description
JP3.1	VDDI2C	I^2C/CCI VDDIO
JP3.2	SCL	I^2C/CCI SCL
JP3.3	SDA	I^2C/CCI SDA
JP3.4	GND	Ground

Table 5. Control Status

Reference	Signal	Description
JP4.1	LOCK	LOCK = 1, PLL acquired lock to the reference clock input LOCK = 0, PLL is unlocked
JP4.3	PASS	PASS = 1: No fault detected on input display timing. PASS = 0: Indicates an error condition or corruption in display video timing.
JP4.5	GPIO	General Purpose I/O

Table 6. CMLOUT Output Signals

Reference	Signal	Description
J3	CMLOUT+	SMA connector
J9	CMLOUT-	SMA connector

Table 7. EQ Setting SW-DIP3 – S2

Reference	Signal	Description		
S2.1	EQ1	Receiver Equalization Configuration		
			EQ[3:1]	**EQ Boost**
			001	~3 dB
			010	~4.5 dB
S2.2	EQ2		011	~6 dB
			100	~7.5 dB
			101	~9 dB
S2.3	EQ3		110	~10.5 dB
			111	~12 dB
			000	OFF* **(Default)**

Table 8. Config/ID Setting SW-DIP4 – S1

Reference	Signal	Description			
S1.1	CONFIG0	Configuration Modes			
			CONFIG1	**CONFIG0**	**MODE**
			L **(Default)**	L **(Default)**	DS90UR905Q/907Q, DS90Ux925Q
S1.2	CONFIG1		L	H	DS90UR905Q/907Q, DS90Ux925Q
			H	L	DS90UR241Q, DS99R421Q
			H	H	DS90C241Q
S1.3	ID0	CCI/I2C Slave Address Select			
			ID1	**ID0**	**SLAVE ADDRESS**
			L **(Default)**	L **(Default)**	0x3C'h (0x78'h<<1)
S1.4	ID1		L	H	0x3D'h (0x7A'h<<1)
			H	L	0x36'h (0x6C'h<<1)
			H	H	0x37'h (0x6E'h<<1)

Table 9. BISTEN/PDN Setting SW-DIP2 – S3

Reference	Signal	Input = L	Input = H	Description
S3.1	BISTEN	Normal operating mode. BIST is disabled **(Default)**	BIST Mode is enabled.	BIST Enable Input
S3.2	PDN	Power Down (Disabled)	Operational **(Default)**	Power Down Mode Input

2.2 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 or video data/controls:

1. Digital Video Source – for generation of specific display timing such as Digital Video Processor or Graphics Controller (GPU) with digital RGB (1.8V/3.3V LVCMOS) output.
2. Any other signal generator / video source - This video generator may be used for video signal sources for 6/8-bit Digital 1.8V/3.3V LVCMOS/RGB
3. Any other signal / video generator that generates the correct input levels as specified in the datasheet.
4. Programming the DS90Ux925Q to use the internal pattern generation feature. For detailed information, refer to SNLA132.

The following is a list of typical test equipment that may be used to monitor the MIPI CSI-2 signals from the DS90UR910Q:

1. Logic Analyzer
   - Agilent Protocol Analyzer and Exerciser for MIPI D-PHY Interfaces
   - Agilent Logic Analyzer with MIPI CSI2 software loaded
   - Agilent N4851A/B MIPI Analyzer
   - Agilent E5381A Differential Flying Lead Set Probe
2. Any SCOPE with a bandwidth of at least 75MHz for 1.8V/3.3V LVCMOS and/or 1.5GHz for observing differential signals.
3. UNH-IOL MIPI D-PHY Reference Termination Board (RTB)
4. UNH-IOL MIPI D-PHY/CSI/DSI Probing Board
5. UNH-IOL CSIGUI Tool

Figure 4 below shows a typical test set up using a Graphics Controller and display.

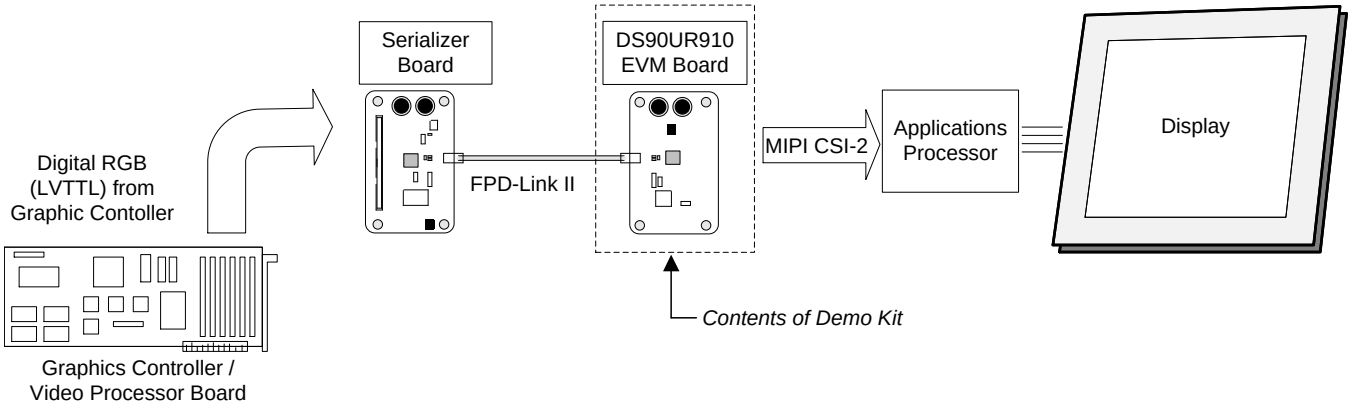


Figure 4. Typical Test Setup for Video Application

Figure 5 below shows a typical test set up using a video generator and logic analyzer.

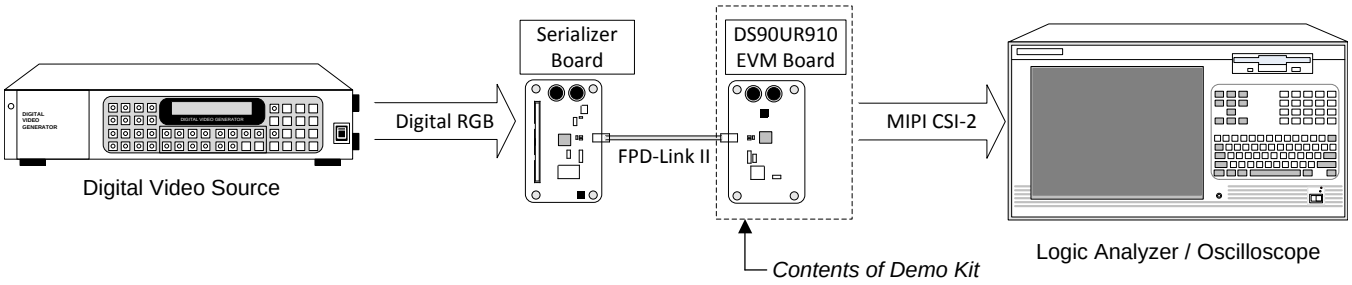


Figure 5. Typical Test Setup for Evaluation

2.3 CSI-2 Interface

The DS90UR910Q (in default mode) takes the RGB data bits R[7:0], G[7:0] and B[7:0] defined in the 24-bit serializer pinout and directly maps to the RGB888 color space in the data frame. The DS90UR910Q follows the General Frame Format as described in the CSI-2 standard.

Valid video signals and display timing (DE, VS, and HS) is required in order for the DS90UR910Q CSI-2 interface to operate. Upon the end of the vertical sync pulse (VS), the DS90UR910Q generates the Frame End and Frame Start synchronization packets within the vertical blanking period. The timing of the Frame Start will not reflect the timing of the VS signal. Upon the rising edge of the DE signal, each active line is output in a long data packet with the RGB888 data format. At the end of each packet, the data lanes DATA0± and DATA1± return to the LP-11 state, while the clock lane CLK± continue outputting the high speed clock.

2.4 Terminal Device

A termination device is required in order to properly monitor and measure the transmission of the CSI-2 signals. The termination device should support the change of signals as it switches between LP and HS modes. This can be provided by either a CSI-2 receiver or a dedicated dynamic termination board. The recommended termination board is the UNH-IOL MIPI D-PHY Reference Termination Board (RTB).

2.5 CMLOUT Outputs for Eye Monitor

Connector J3 connects to CMLOUT+ and J9 connects to CMLOUT-, which are present on left side of DS90UR910Q Evaluation board. CMLOUT+/- must be enabled by register, 0x04[7] = 1, to be able to monitor the FPD-Link II serial stream.

3 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.

3.1 Equipment References

Digital Video Pattern Generator:

Astrodesign – *www.astro-americas.com*

Logic Analyzer:

Agilent Technologies Inc – *www.agilent.com*

MIPI Test Fixtures:

University of New Hampshire InterOperability Laboratory (UNH-IOL) – *www.iol.unh.edu/services/testing/mipi/fixtures.php*

I^2C Adapters:

Corelis CAS-1000-I2C/E I2C Bus Analyzer and Exerciser – *www.corelis.com/products/I2C-Analyzer.htm*

Aardvark I2C/SPI Host Adapter Part Number: TP240141 – *www.totalphase.com/products/aardvark_i2cspi*

3.2 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*

4 Bill of Materials for DS90UR910QEVM:

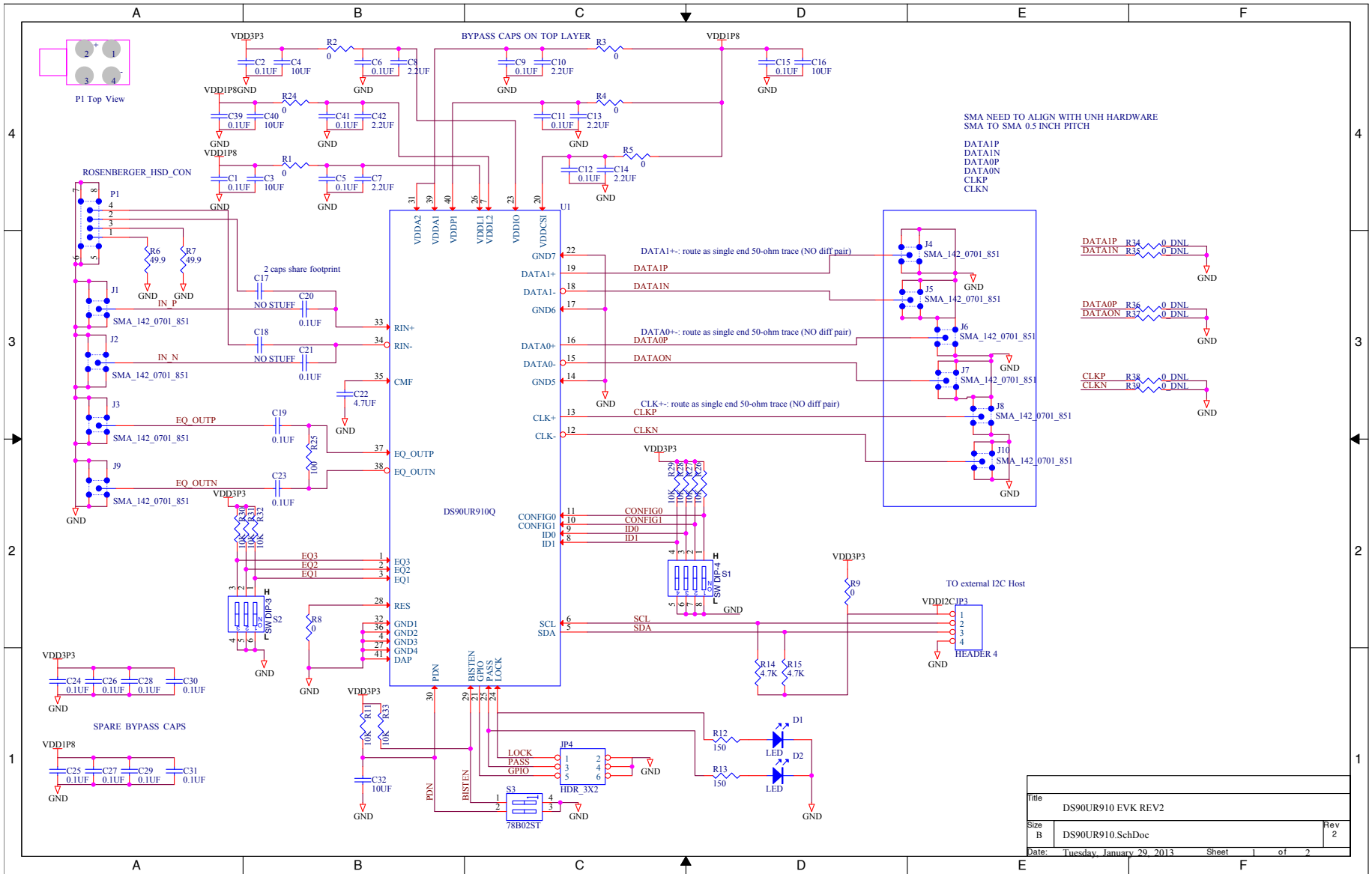
Table 10. DS90UR910QEVM BOM

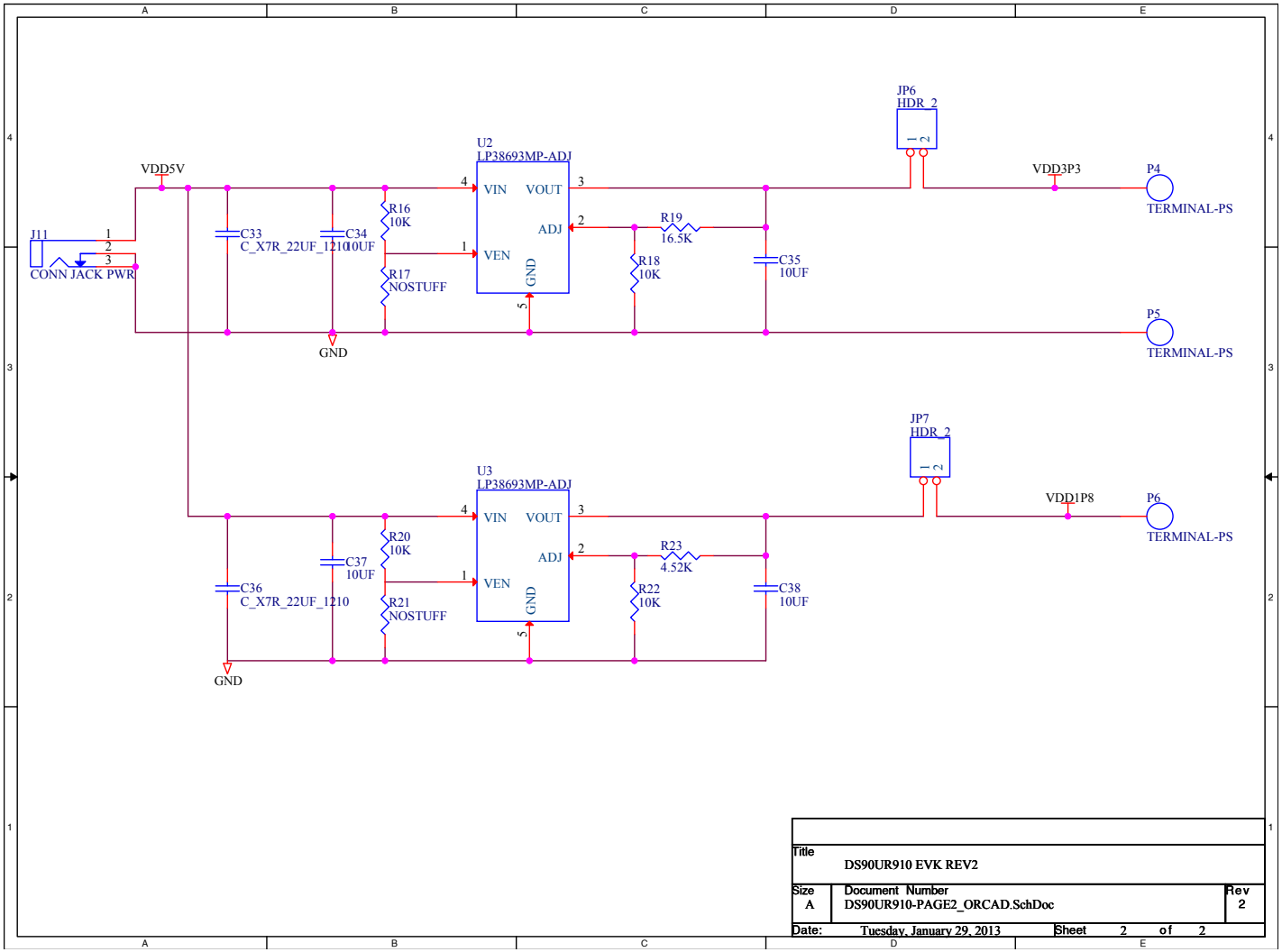
Item	Qty	Reference	Value	Manufacture PN	Vendor	Description
1	22	C1,C2,C5,C6,C9,C11,C12,C15,C19,C20,C21,C23,C24,C25,C26,C27,C28,C29,C30,C31,C39,C41	0.1UF	GRM155R71C104KA88D	Murata	CAP CER 0.1UF 16V 10% X7R 0402
2	5	C3,C4,C16,C32,C40	10UF	LMK107BJ106MALTD	Taiyo Yuden	CAP CER 10UF 10V 20% X5R 0603
3	6	C7,C8,C10,C13,C14,C42	2.2UF	JMK105BJ225MV-F	Taiyo Yuden	CAP CER 2.2UF 6.3V 20% X5R 0402
4	0	C17,C18	NO STUFF	GRM155R71C104KA88D	Murata	CAP CER 0.1UF 16V 10% X7R 0402
5	1	C22	4.7UF	CGB3B1X5R1A475M055AC	TDK	CAP CER 4.7UF 10V 20% X5R 0603
6	2	C33,C36	C_X7R_22UF_1210	C3225X7R1A226K230AC	TDK	CAP CER 22UF 10V 10% X7R 1210
7	2	C34,C37	10UF	EMK212BJ106KG-T	Taiyo Yuden	CAP CER 10UF 16V 10% X5R 0805
8	2	C35,C38	10UF	EMK107BBJ106MA-T	Taiyo Yuden	CAP CER 10UF 16V 20% X5R 0603
9	2	D1,D2	LED	LTST-C191KGKT	Lite-On Inc	LED GREEN CLEAR THIN 0603 SMD.
10	1	JP3	HEADER 4	68001-204HLF	FCI	CONN HEADER 4POS .100"
11	1	JP4	HDR_3X2	68602-206HLF	FCI	CONN HEADER 6POS .100"
12	2	JP6,JP7	HDR_2	68001-202HLF	FCI	BERGSTIK II .100
13	10	J1,J2,J3,J4,J5,J6,J7,J8,J9,J10	SMA_142_0701_851	142-0701-851	Emerson	CONN JACK END LAUNCH PC GOLD SMA
14	1	J11	CONN JACK PWR	RAPC712X	Switchcraft Inc.	CONN POWERJACK MINI R/A PCMT
15	1	P1	ROSENBERGER_HSD_CON	D4S20D-40ML5-Y	Rosenberger	Male Right angle SMD
16	3	P4,P5,P6	TERMINAL-PS	108-0740-001	Emerson	CONN JACK BANANA UNINS PANEL MOU
17	7	R1,R2,R3,R4,R5,R9,R24	0	RC0402JR-070RL	Yageo	RES 0.0 OHM 1/16W 0402 SMD
18	2	R6,R7	49.9	ERJ-2RKF49R9X	Panasonic	RES 49.9 OHM 1/10W 1% 0402 SMD
19	1	R8	0	RC0402JR-070RL	Yageo	RES 0.0 OHM 1/16W 0402 SMD
20	9	R11,R26,R27,R28,R29,R30,R31,R32,R33	10K	ERJ-3EKF1002V	Panasonic	RES 10.0K OHM 1/10W 1% 0603 SMD
21	1	R12	150	ERJ-2RKF1500X	Panasonic	RES 150 OHM 1/10W 1% 0402 SMD
22	1	R13	150	ERJ-2RKF1500X	Panasonic	RES 150 OHM 1/10W 1% 0402 SMD
23	2	R14,R15	4.7K	ERJ-2RKF4701X	Panasonic	RES 4.70K OHM 1/10W 1% 0402 SMD
24	3	R16,R18,R22	10K	ERJ-3EKF1002V	Panasonic	RES 10.0K OHM 1/10W 1% 0603 SMD
25	0	R17,R21	NOSTUFF			
26	1	R19	16.5K	ERJ-3EKF1652V	Panasonic	RES 16.5K OHM 1/10W 1% 0603 SMD

Table 10. DS90UR910QEVM BOM (continued)

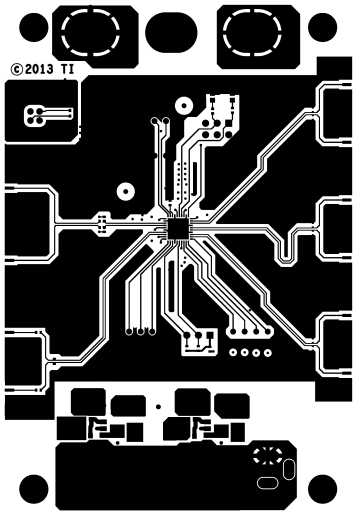
Item	Qty	Reference	Value	Manufacture PN	Vendor	Description
27	1	R20	10K	ERJ-3EKF1002V	Panasonic	RES 10.0K OHM 1/10W 1% 0603 SMD
28	1	R23	4.52K	ERJ-3EKF4531V	Panasonic	RES 4.53K OHM 1/10W 1% 0603 SMD
29	1	R25	100	ERJ-2RKF1000X	Panasonic	RES 100 OHM 1/10W 1% 0402 SMD
30	0	R34,R35,R36, R37,R38,R39	0_DNL	RC0201FR-070RL	Yageo	RES 0.0 OHM 1/20W 0201 SMD
31	1	S1	SW DIP-4	78B04ST	Grayhill	SWITCH DIP EXTENDED SEALED 4POS
32	1	S2	SW DIP-3	78B03ST	Grayhill	SWITCH DIP EXTENDED SEALED 3POS
33	1	S3	78B02ST	78B02ST	Grayhill Inc	SWITCH DIP EXTENDED SEALED 2POS
34	1	U1	DS90UR910Q	DS90UR910QSQE/ NOPB	TI	IC SERIALIZER FPD-CSI2 48WQFN
35	2	U2,U3	LP38693MP-ADJ	LP38693MP-ADJ/NOPB	TI	IC REG LDO ADJ .5A SOT223-4
36	1	DS90UR910Q EVM PCB	SV600551-001	PCB board		

5 Schematic for DS90UR910QEVM:





6 EVM Layout



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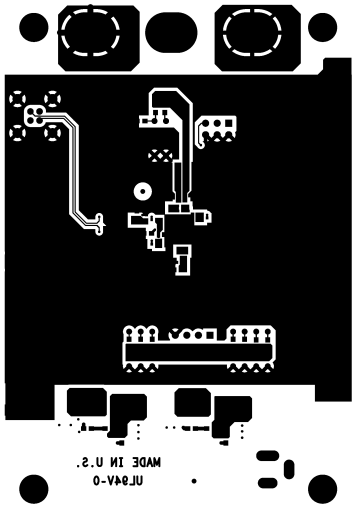
LAYER: TOP		



TEXAS INSTRUMENTS		
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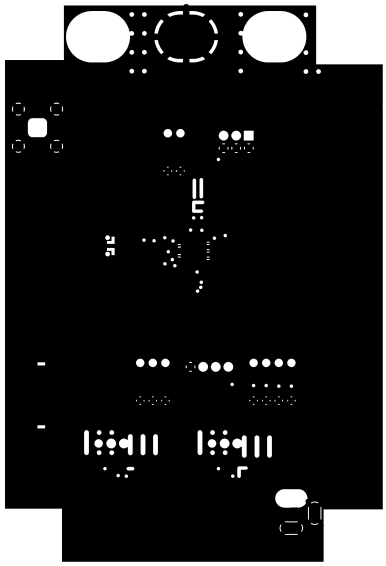
DATE: JULY 2013	JOB: 305-PD-12-0905	Rev.2
LAYER: BOTTOM		



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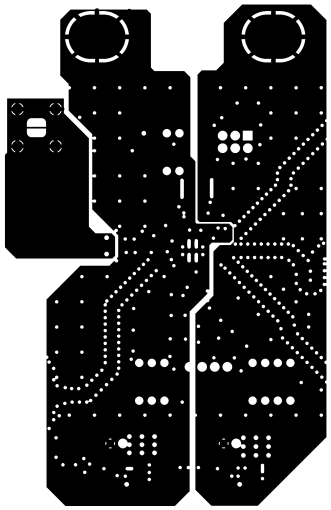

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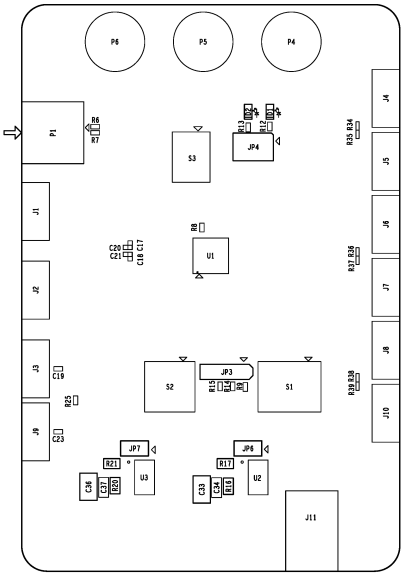

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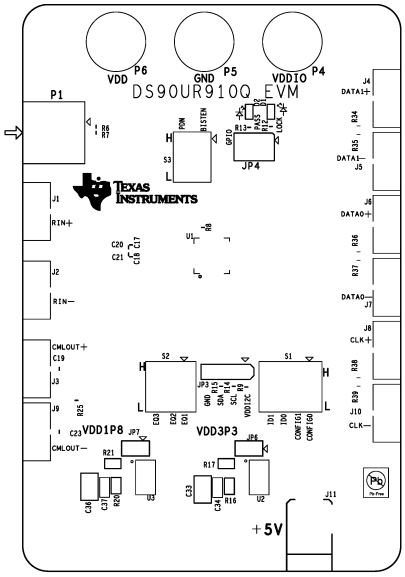
LAYER: TOP_ASY		



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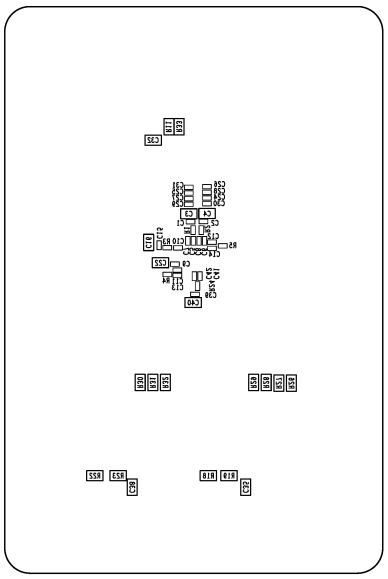

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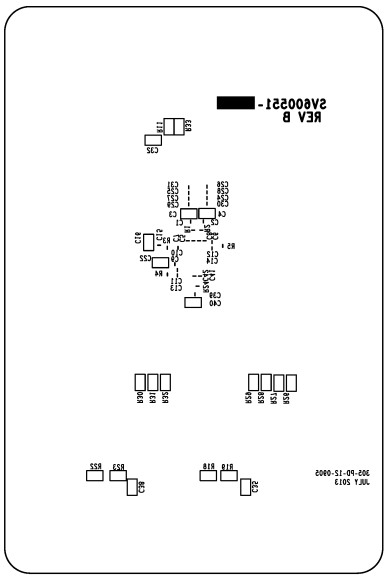

TEXAS INSTRUMENTS		
NAME: DS90UR910Q EVM		
DATE: JULY 2013	JOB: 305-PD-12-0905	Rev.2
LAYER: BOTTOM SILK		

7 EVM PCB Stackup

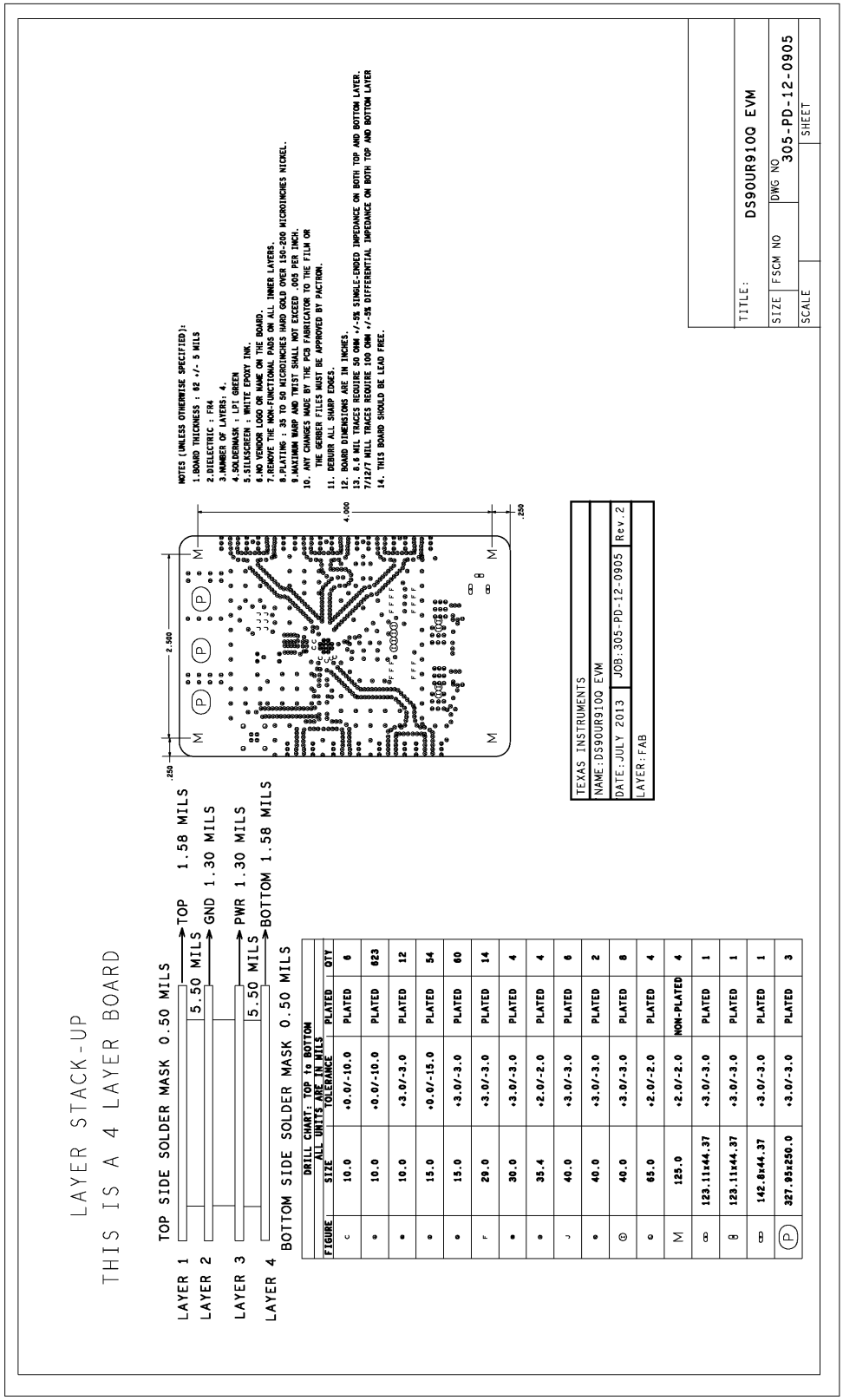

Figure 6. Board Stackup

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

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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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西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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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:*

   6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

   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.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS AND CONDITIONS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

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.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY WARRANTY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS, OR ANY USE OF ANY TI EVM PROVIDED HEREUNDER, EXCEED THE TOTAL AMOUNT PAID TO TI FOR THE PARTICULAR UNITS SOLD UNDER THESE TERMS AND CONDITIONS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM AGAINST THE PARTICULAR UNITS SOLD TO USER UNDER THESE TERMS AND CONDITIONS SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

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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In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

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