TVB1440 EVM

This document describes how to use and configure the TVB1440 EVM, along with recommendations for system hardware implementation. These recommendations are only guidelines and it is designer's responsibility to consider all system characteristics and requirements. The engineers should refer to the datasheet (SLASE51) for technical details such as device operation, terminal description, and so forth.

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1 Overview

1.1 What is the TVB1440?

The TVB1440 is a four-channel re-driver signal conditioner for TV applications, allowing signal integrity between TV chipset and a TCON. It has selectable control for receive equalization to compensate for large trace or cable loss at its input resulting in a improved eye at the TVB1440's output. Each of the TVB1440 transmitters has independent control for voltage swing and pre-emphasis.

1.2 What is the TVB1440 EVM?

The TVB1440 EVM is a PCB created to help customers evaluate the TVB1440 device for TV applications. This EVM can also be used as a hardware reference design for implementation of the TVB1440 in the 48-pin VQFN (RGZ) package.

PCB design/layout files can be provided upon request to aid PCB design with a TVB1440 component. The layout files can be used as a guideline to implement the TVB1440 with illustrations of the routing/placement rules. Please note that the EVM design includes test components to evaluate the TVB1440 which may not be needed for all applications.

1.3 What is Included in the TVB1440 EVM?

The EVM contains the following major components:

- TVB1440
- SAMTEC connectors for user-defined daughterboards.
- On-board USB to I^2C interface for communication with external PC
- I^2C programming interface for external I^2C host connection

1.4 What Does This EVM Look Like?

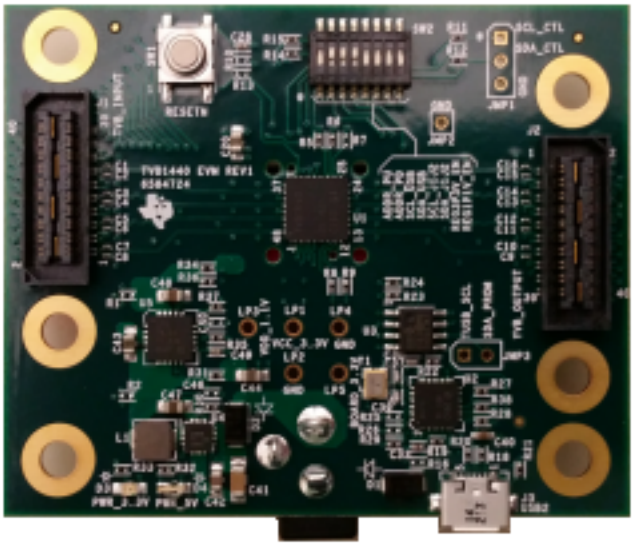


Figure 1. TVB1440 EVM

2 Hardware Description

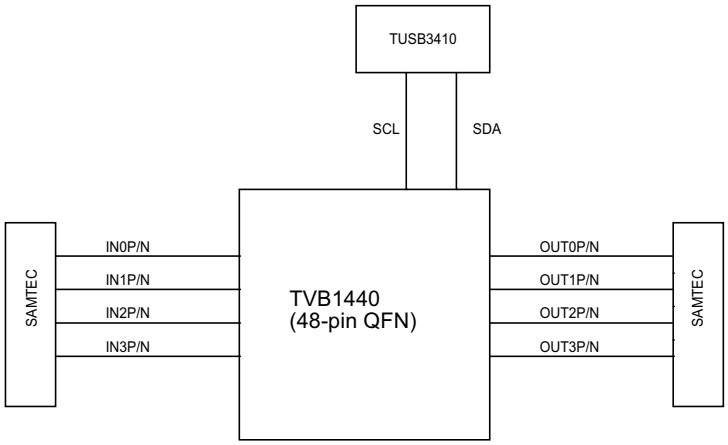


Figure 2. TVB1440 EVM Block Diagram

2.1 Video Connectors

Video into and out of the TVB1440 is supported using the two Samtec QSH (Samtec P/N: QSH-020-01-L-D-DP-A) connectors. The input video connector is J1 and the output video connector is J2. Note that the J2 is rotated on the PCB 180 degrees from J1.

The mating connector part number is QTH-020-01-L-D-DP-A. For SMA-type connection, HDR-128291-XX breakout board from Samtec can be used. The HDR-128291-XX is a breakout board with a mating connector to J1 or J2 and standard SMA male connectors via cables.

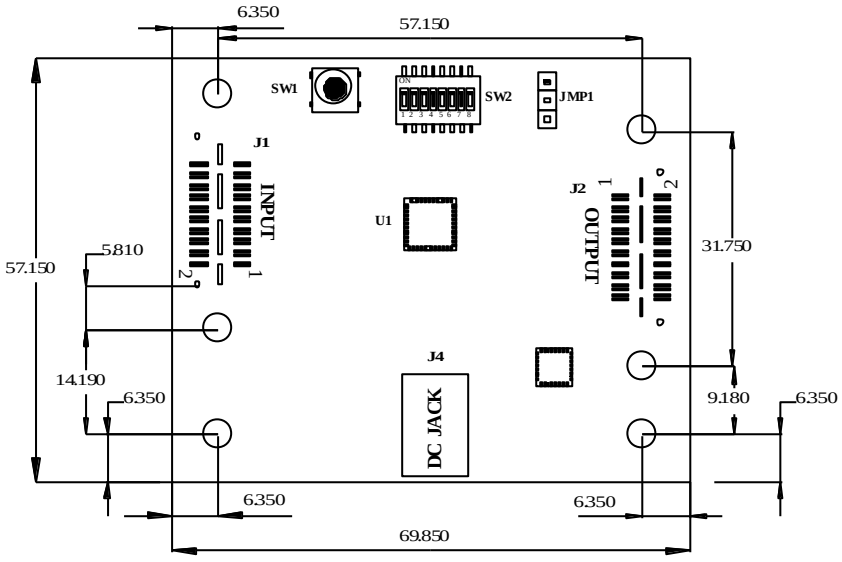
Table 1. Video Input Connector (J1)

Pin No.	Name	Pin No.	Name
1	IN3N	2	J1J2_SDA_CTL
3	IN3P	4	J1J2_SCL_CTL
5	GND	6	Connected to J2 pin 6
7	GND	8	Connected to J2 pin 8
9	IN2N	10	Connected to J2 pin 10
11	IN2P	12	Connected to J2 pin 12
13	GND	14	Connected to J2 pin 14
15	GND	16	Connected to J2 pin 16
17	IN1N	18	Connected to J2 pin 18
19	IN1P	20	Connected to J2 pin 20
21	GND	22	Connected to J2 pin 22
23	GND	24	Connected to J2 pin 24
25	IN0N	26	J1J2_12V
27	IN0P	28	J1J2_12V
29	GND	30	J1J2_12V
31	GND	32	J1J2_12V
33	NC	34	J1J2_3.3V
35	NC	36	J1J2_3.3V
37	NC	38	J1J2_1.1V
39	NC	40	J1J2_1.1V

Table 2. Video Output Connector (J2)

Pin No.	Name	Pin No.	Name
1	OUT0P	2	J1J2_SDA_CTL
3	OUT0N	4	J1J2_SCL_CTL
5	GND	6	Connected to J1 pin 6
7	GND	8	Connected to J1 pin 8
9	OUT1P	10	Connected to J1 pin 10
11	OUT1N	12	Connected to J1 pin 12
13	GND	14	Connected to J1 pin 14
15	GND	16	Connected to J1 pin 16
17	OUT2P	18	Connected to J1 pin 18
19	OUT2N	20	Connected to J1 pin 20
21	GND	22	Connected to J1 pin 22
23	GND	24	Connected to J1 pin 24
25	OUT3P	26	J1J2_12V
27	OUT3N	28	J1J2_12V
29	GND	30	J1J2_12V
31	GND	32	J1J2_12V
33	NC	34	J1J2_3.3V
35	NC	36	J1J2_3.3V
37	NC	38	J1J2_1.1V
39	NC	40	J1J2_1.1V

For designers needing to design their own customer daughterboard that mates to the TVB1440 EVM, the necessary information needed to develop the daughterboard is provided below.



All Dimensions in mm

NOTE: All six large plated mounting holes are 160 mils (±3 mils) diameter.

Figure 3. TVB1440 EVM Mechanical Drawing

2.2 Local I²C Access

There are three options to access the TVB1440's local I²C registers:

1. 3-pin 100-mil male header
2. Through USB Micro-AB connect via the TUSB3410
3. Through the SAMTEC connectors J1 and J2

2.2.1 Via 3-Pin 100-mil Male Header

A stand alone external I²C host can be connected via JMP1 for debug and control purposes. An example of an external I²C Host controller is the Total Phase Aardvark I2C/SPI Host Adapter (Total Phase Part#: *TP240141*).

Table 3. JMP1 Pin-out

JMP1	Description
1	SCL_CTL
2	SDA_CTL
3	GND

When using JMP1, it is recommended to make sure SW2-3, SW2-4, SW2-5, and SW2-6 are all in the "OFF" position.

2.2.2 Via USB Interface

Communication with TVB1440 can also be accomplished using the USB Micro-AB connector (J3) through the TUSB3410. When using this interface, make sure SW2-5 and SW2-6 are in the "OFF" position, and SW2-3 and SW-4 are in the "ON" position. Also, if the DC jack is plugged into J4, then make sure the voltage of the DC jack is greater than 5.5 V.

2.2.3 Via J1/J2 Samtec Connector

Communication with the TVB1440 can also be accomplished through the Samtec connectors J1. If it is required for the I²C interface to be routed to the second Samtec connector (J2), then resistors R3 and R4 must be populated.

Communication through the Samtec connectors requires that both SW2-5 and SW2-6 are in the "ON" position, and SW2-3 and SW2-4 are in the "OFF" position.

2.3 Enable/Reset

There are three device enable/reset options to use with the EVM.

1. RC timing option

   C28 external capacitor and TVB1440's internal resistor are used to control the RSTN ramp time after the device is powered on.
2. External control option

   A push button (SW1) available for the manual control of the TVB1440's RSTN input.

2.4 Power

EVM provides three means to provide power to the TVB1440:

1. DC Power Jack (J4)
2. USB Micro-AB connector (J3)
3. Samtec connector J1 and J2. By default, either power can be applied via the DC jack or the USB Micro-AB connector. If power is required through the J1 and J2 connectors, then R1 (for 1.1-V power) and R2 (for 3.3-V power) must be installed.

Choose only one power source (DC jack, USB Micro-AB, or Samtec J1/J2). If both DC jack and USB interface are used together, make sure the DC jack power is greater than 5.5 V.

2.4.1 DC Jack (J4)

A DC power jack (J9) to accept a 5-V to 17-V wall power adapter is provided on the EVM. The DC power jack (CUI Inc. PJ-202AH) has an inner diameter of 2.1 mm and an outer diameter of 5.5 mm. The tip of the power supply must be positive. A power supply of at least 0.5 A that meets these requirements can be used to power the TVB1440 EVM.

CAUTION

Care should be taken not to plug in any power source higher than the configured voltage (5 V to 17 V).

2.4.2 USB Micro-AB

A standard USB Micro-AB connector is included on the EVM to allow for powering the EVM from an external USB power source.

2.5 SW2 DIP Switch Configuration

Table 4. SW2 DIP Switch Setting

DIP SW No.	Description			Default Config	
				OFF (Open)	ON (Closed)
SW2.1	TVB1440 I2C Slave Address			X	
	SW2-1[1]	SW2-2[1]	Address(W/R)		
SW2.2	OFF	ON	0x58/59 (Default)		X
	ON	ON	0x5A/5B		
	ON	OFF	0x5C/5D		
SW2-3	TUSB3410 connected to TVB1440's SCL_CTL pin ON: Connected to SCL_CTL OFF: Disconnected from SCL_CTL				X
SW2-4	TUSB3410 connected to TVB1440's SDA_CTL pin ON: Connected to SDA_CTL OFF: Disconnected from SDA_CTL				X
SW2-5	J1J2 I^2C Clock routed to TVB1440's SCL_CTL pin ON: Connected to SCL_CTL OFF: Disconnected from SCL_CTL			X	
SW2-6	J1J2 I^2C Data routed to TVB1440' SDA_CTL pin ON: Connected to SDA_CTL OFF: Disconnected from SDA_CTL			X	
SW2-7	3.3 V Regulator enable ON: Regulator disabled OFF: Regulator enabled			X	
SW2-8	1.1 V Regulator enable ON: Regulator disabled OFF: Regulator enabled			X	

(1) SW2-1 and SW2-2 both in OFF (open) position are not a valid combination and therefore should not be used.

3 Quick Start Guide

1. Make sure the DIP switch (SW2) setting is in a correct configuration based on Table 4.
2. Plug in a daughterboard which mates to a Samtec QSH-020-01-L-D-DP-A into J1.
3. Plug in a daughterboard which mates to a Samtec QSH-020-01-L-D-DP-A into J2.
4. Apply power to the EVM. LED D4 and LED D9 should light up.
5. Configure the TVB1440 using the local I^2C interface mentioned in Section 2.2 of this document.
6. Enable video source.
7. Video output on sink should be observed.

4 References

1. TVB1440 Datasheet (SLASE51)
2. *Aardvark Adapter User Manual*

5 EVM Bill of Materials (BOM)

Table 5 lists the TVB1440 EVM BOM.

Table 5. EVM Bill of Materials

Item	Qty.	Reference	Part	Manuf	Manuf PN	Digikey PN
1	16	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16	0.1µF	TDK	C0603X5R1E104K030BB	445-13671-2-ND
2	10	C17, C18, C19, C21, C25, C26, C29, C32, C33, C38	0.1µF	TDK	C1005X5R1E104K050BC	445-4964-2-ND
3	5	C20, C24, C44, C47, C48	10µF	Taiyo Yuden	JMK212B7106KG-T	587-2396-2-ND
4	5	C22, C23, C30, C34, C49	0.01µF	Yageo	CC0402KRX7R7BB103	311-1042-2-ND
5	3	C27, C31, C40	1µF	Taiyo Yuden	EMK107B7105KA-T	587-1241-2-ND
6	1	C28	220nF	TDK	C1005X7R1C224K050BC	445-5936-2-ND
7	2	C35, C36	22pF	Yageo	CC0402JRNPO9BN220	311-1018-2-ND
8	2	C37, C39	33pF	Yageo	CC0402JRNPO9BN330	311-1020-2-ND
9	1	C41	22µF	Murata	GRM31CR61E226KE15L	490-5527-1-ND
10	1	C42	10µF	Murata	GRM21BR61E106KA73L	490-5523-1-ND
11	1	C43	22µF	Yageo	CC0805MKX5R5BB226	311-1464-2-ND
12	1	C45	3.3nF	Yageo	CC0402KRX7R9BB332	311-1034-2-ND
13	2	C46, C50	DNI			
14	2	D1, D2	20V, 1A	Comchip	CDBA120SL-G	641-1255-1-ND
15	1	D3	LED RED 0805	Rohm	SML-211UT86	511-1292-1-ND
16	1	D4	LED Green 0805	Lumex	SML-LXR85GC-TR	67-1557-1-ND
17	1	JMP1	DNI			
18	1	JMP2	DNI			
19	1	JMP3	DNI			
20	2	J1, J2	QSH-020-01	Samtec	QSH-020-01-X-D-DP-A	QSH-020-01-L-D-DP-A-ND
21	1	J3	USB2_MicroAB	Molex	475900001	WM17144CT-ND
22	1	J4	2.1 mm x 5.5 mm	CUI STACK	PJ-202AH	CP-202AH-ND
23	5	LP1, LP2, LP3, LP4, LP5	DNI	KOBIKONN	151-103-RC	
24	1	L1	2.2µH	Vishay	IHLP1616ABER2R2M11	541-1045-1-ND
25	11	R1, R2, R3, R4, R7, R10, R13, R16, R17, R25, R26	DNI			
26	7	R5, R6, R8, R9, R23, R24, R29	1K	Yageo	RC0402JR-071KL	311-1.0KJRCT-ND
27	2	R11, R12	2K	Yageo	RC0402JR-072KL	311-2.0KJRCT-ND
28	5	R14, R15, R22, R27, R30	10K	Yageo	RC0402JR-0710KL	311-10KJRCT-ND
29	2	R18, R20	33	Yageo	RC0402FR-0733RL	311-33.0LRCT-ND
30	1	R19	1.5K	Yageo	RC0402FR-071K5L	311-1.5KLRCT-ND
31	4	R21, R31, R34, R38	0	Yageo	RC0402JR-070RL	311-0.0JRCT-ND
32	1	R28	15K	Yageo	RC0402JR-0715KL	311-15KJRCT-ND
33	1	R32	499	Panasonic	ERJ-2RKF4990X	P499LCT-ND
34	1	R33	348	Vishay	CRCW0402348RFKED	541-348LCT-ND
35	1	R35	4.7K	Yageo	RC0402JR-074K7L	311-4.7KJRCT-ND
36	1	R36	1.87K	Stackpole	RMCF0402FT1K87	RMCF0402FT1K87CT-ND
37	1	R37	4.99K	Yageo	RC0402FR-074K99L	311-4.99KLRCT-ND
38	1	SW1	PB_SWITCH	OMRON	B3SN-3012P	SW261CT-ND
39	1	SW2	8-POS 50-MIL SMT	C&K(ITT-CANNON)	TDA08H0SK1R	TDA08H0SK1R-ND
40	1	U1	TVB1440RGZ	TI	TVB1440RGZ	
41	1	U2	TUSB3410	TI	TUSB3410RHB	296-23092-5-ND
42	1	U3	24LC128T	Microchip Tech	24LC128T-I/SN	24LC128T-I/SNCT-ND
43	1	U4	TPS62142RGTR	TI	TPS62142RGTR	296-29940-1-ND
44	1	U5	TPS74201RGWT	TI	TPS74201RGWT	296-19890-1-ND
45	1	Y1	ECX-12MHZ	ECS	ECX-120-20-33-TR	XC1808CT-ND

6 EVM Schematics

Figure 4 through Figure 9 illustrate the schematics for the TVB1440 EVM.

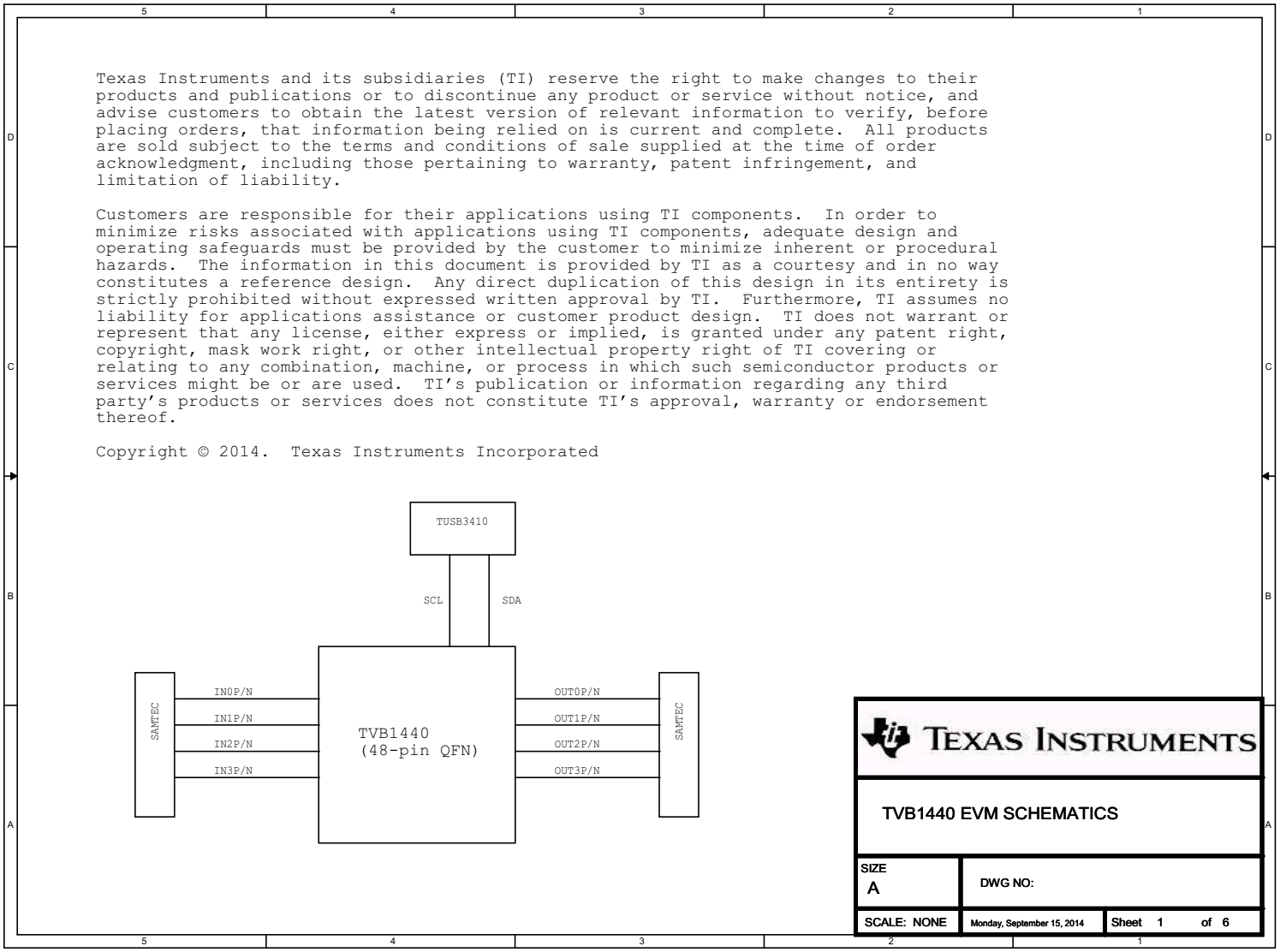


Figure 4. TVB1440 EVM Schematic (1 of 6)

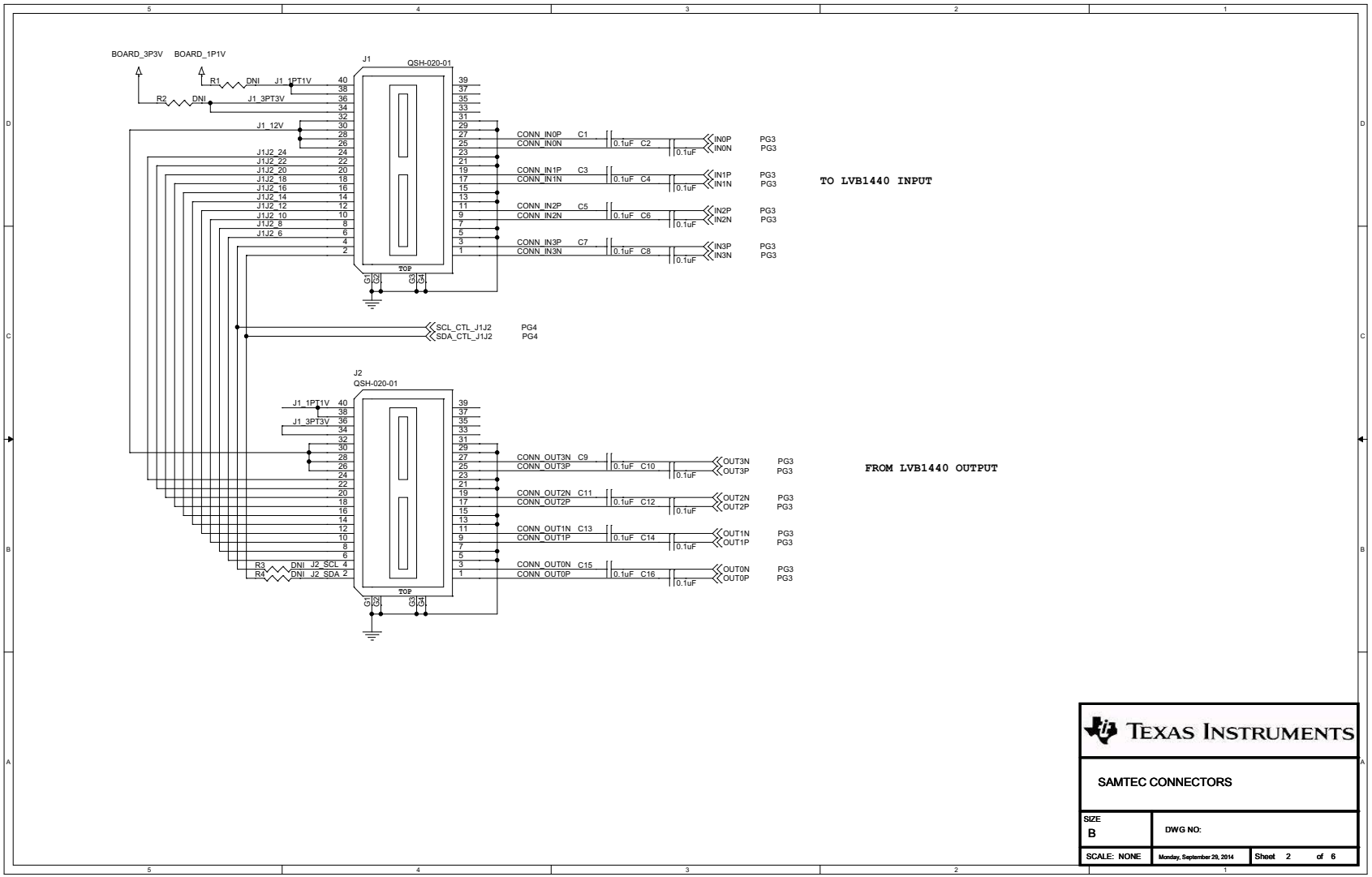


Figure 5. TVB1440 EVM Schematic (2 of 6)

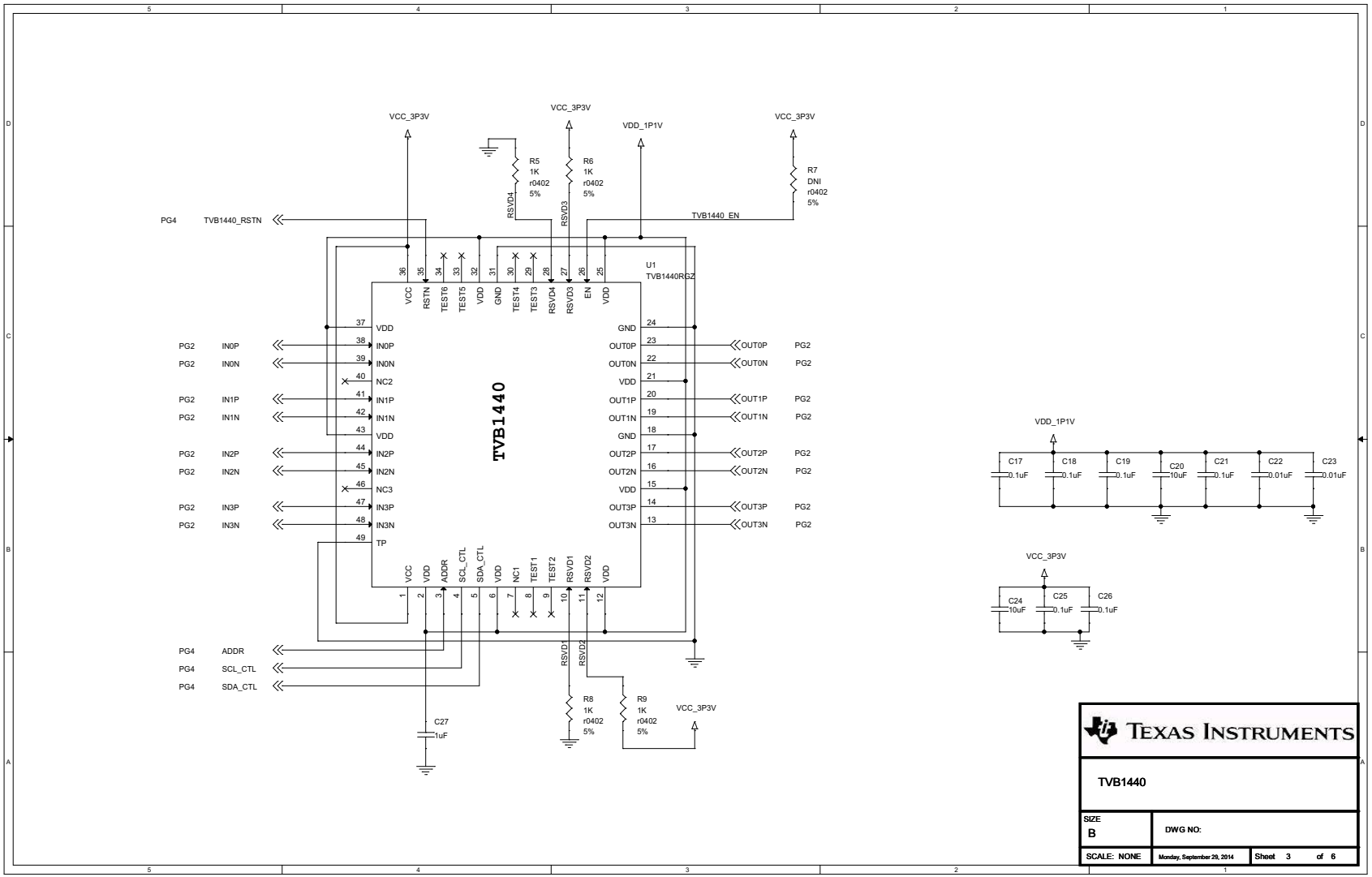


Figure 6. TVB1440 EVM Schematic (3 of 6)

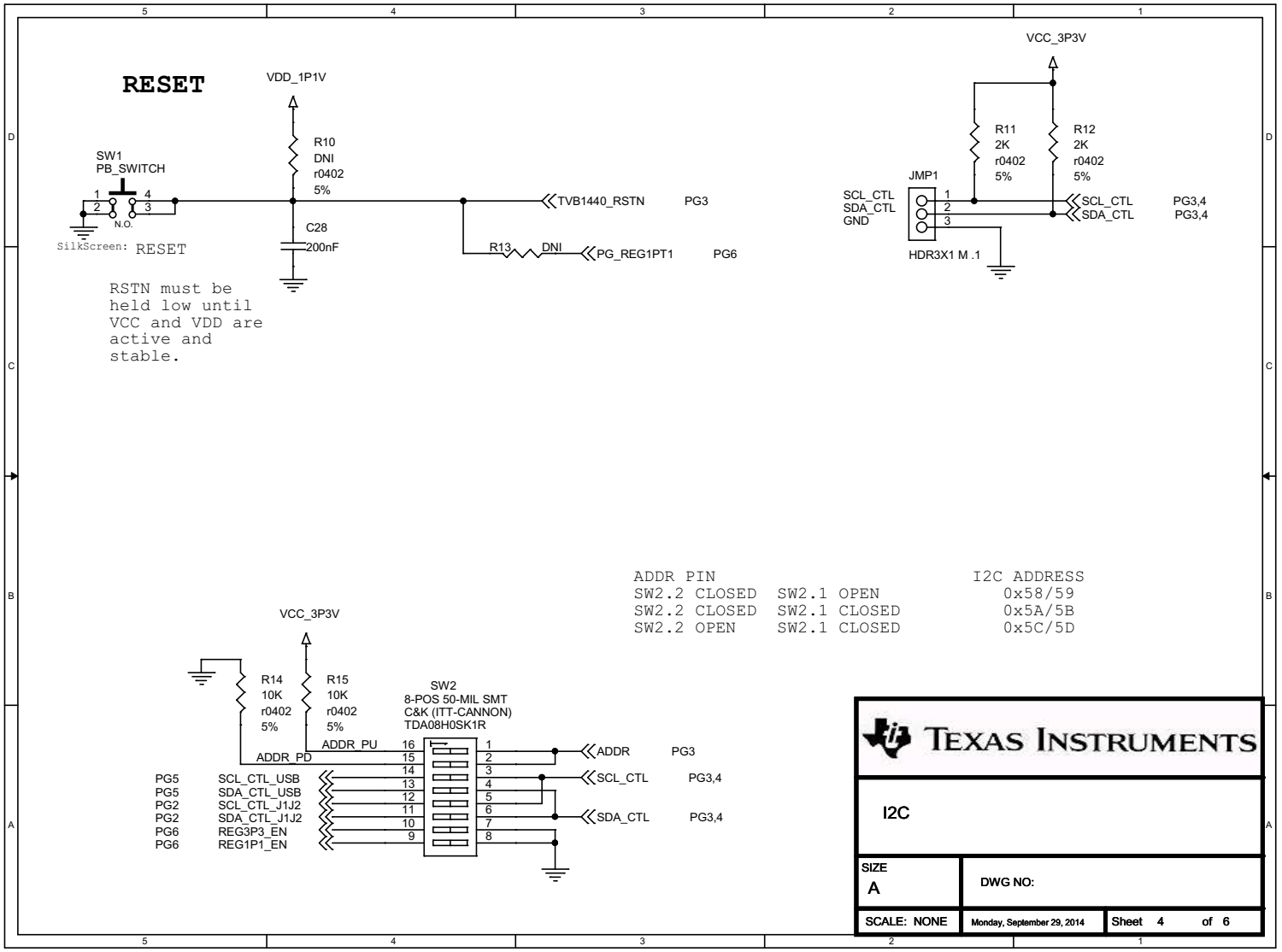


Figure 7. TVB1440 EVM Schematic (4 of 6)

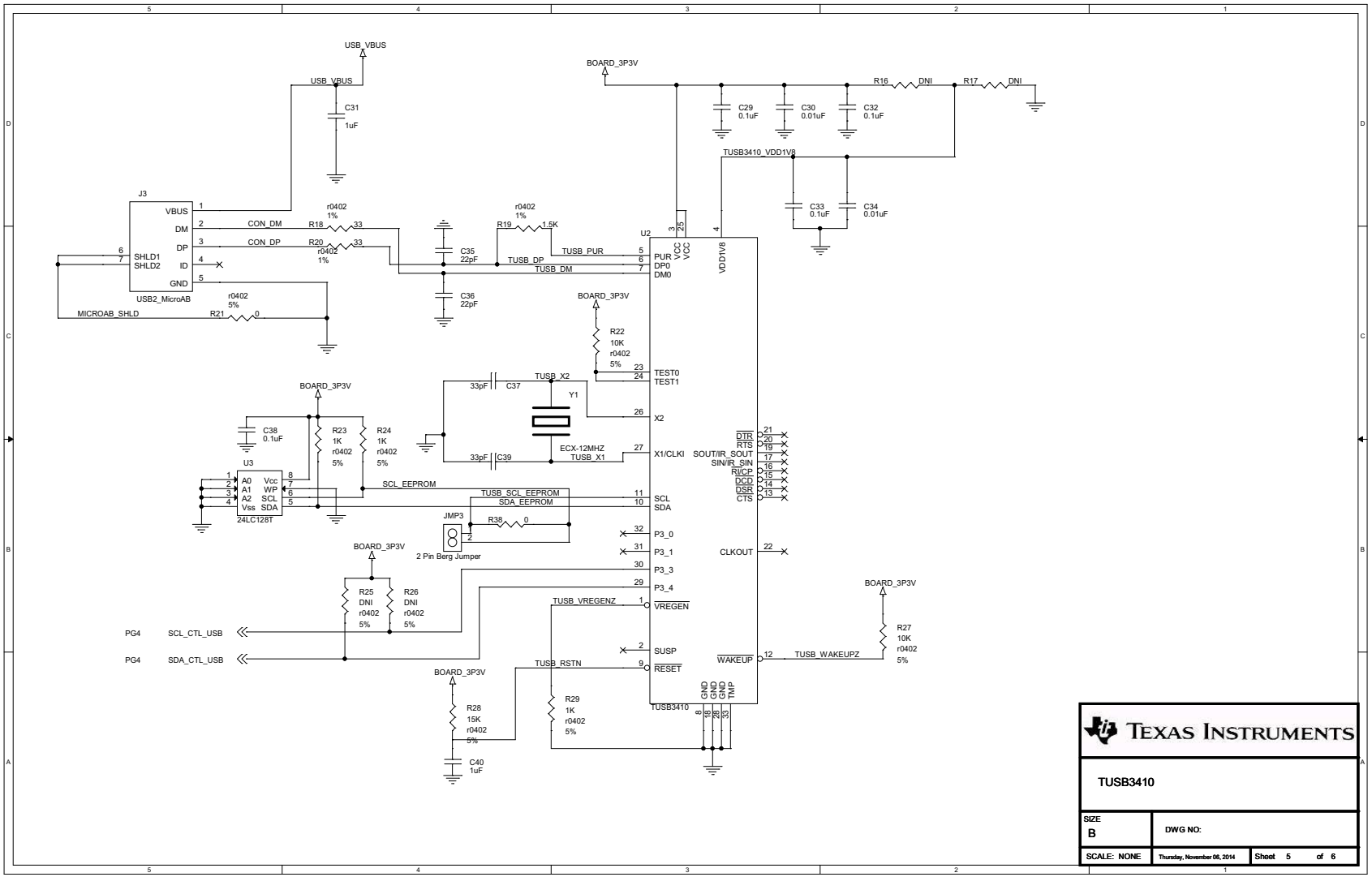


Figure 8. TVB1440 EVM Schematic (5 of 6)

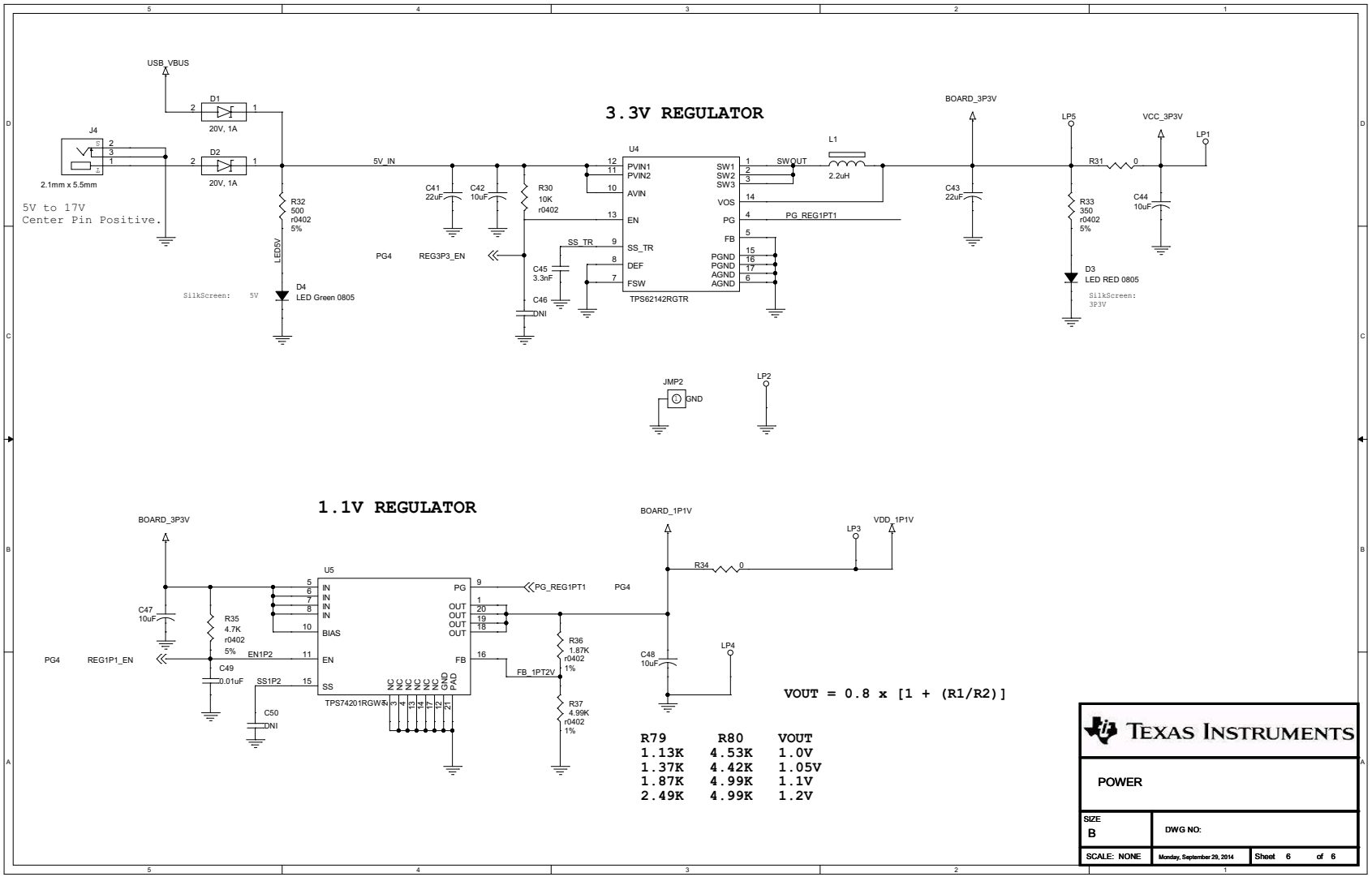


Figure 9. TVB1440 EVM Schematic (6 of 6)

7 EVM Layout

Figure 10 through Figure 15 illustrate the EVM layout images.

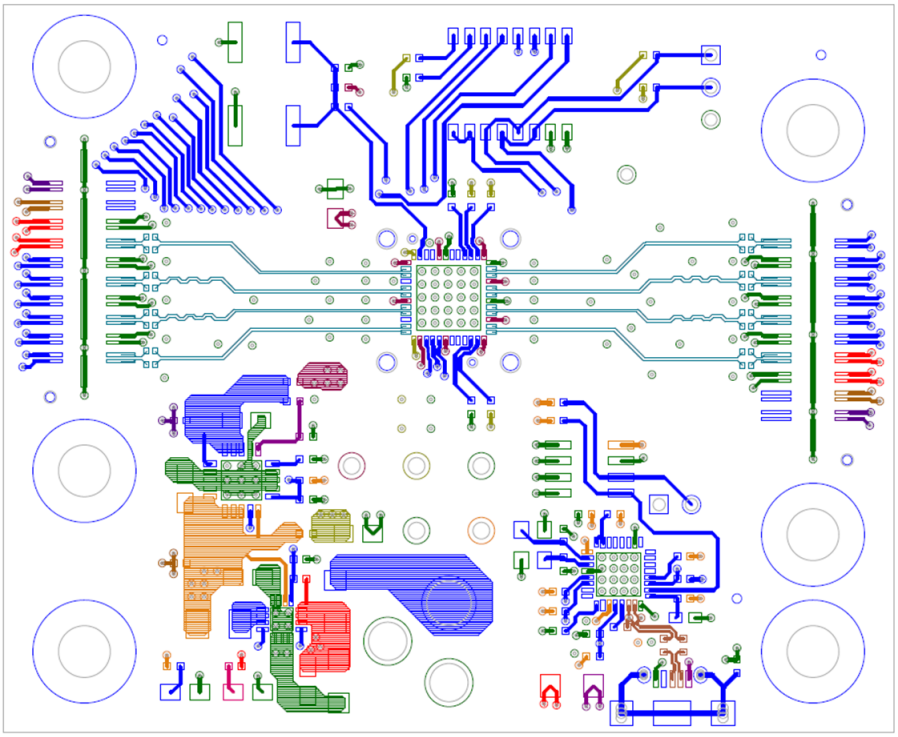


Figure 10. Layer 1 (Top)

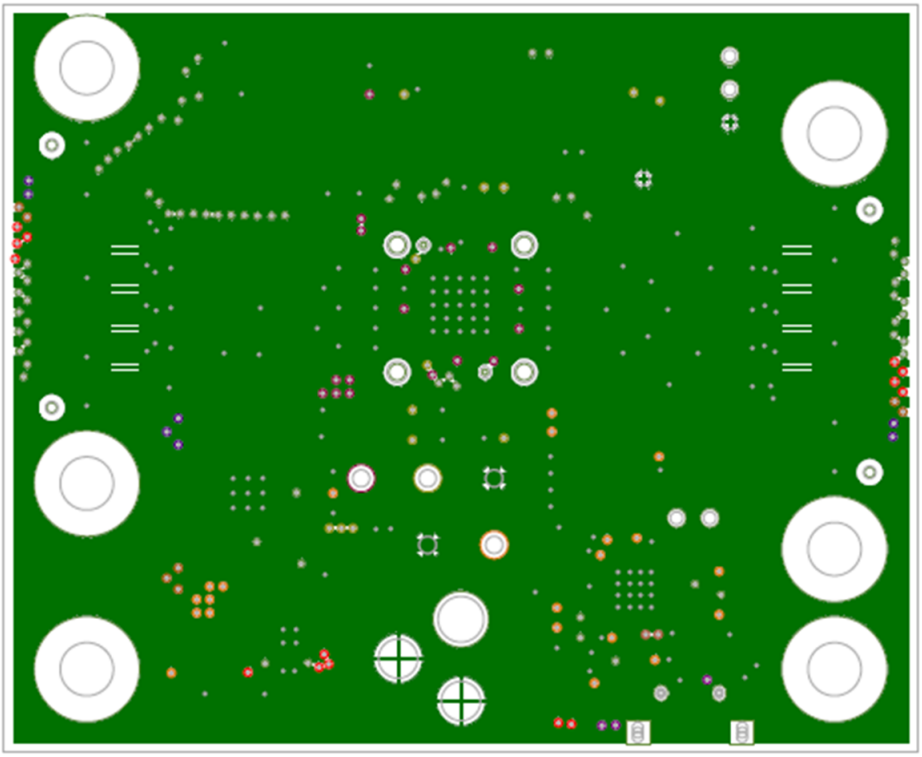


Figure 11. Layer 2 (GND)

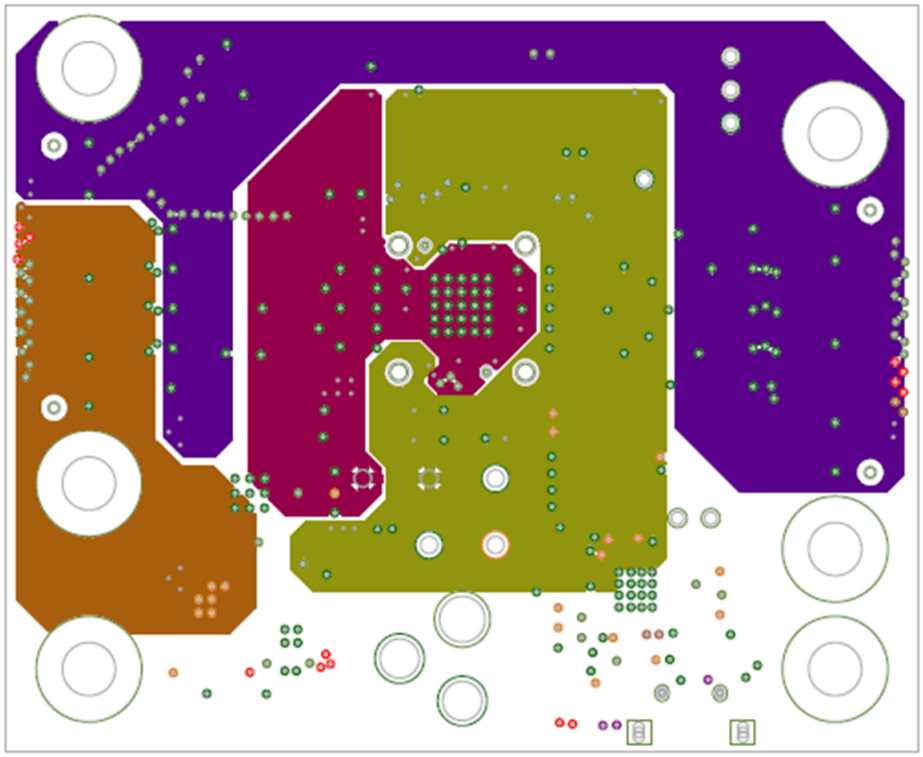


Figure 12. Layer 3 (Power)

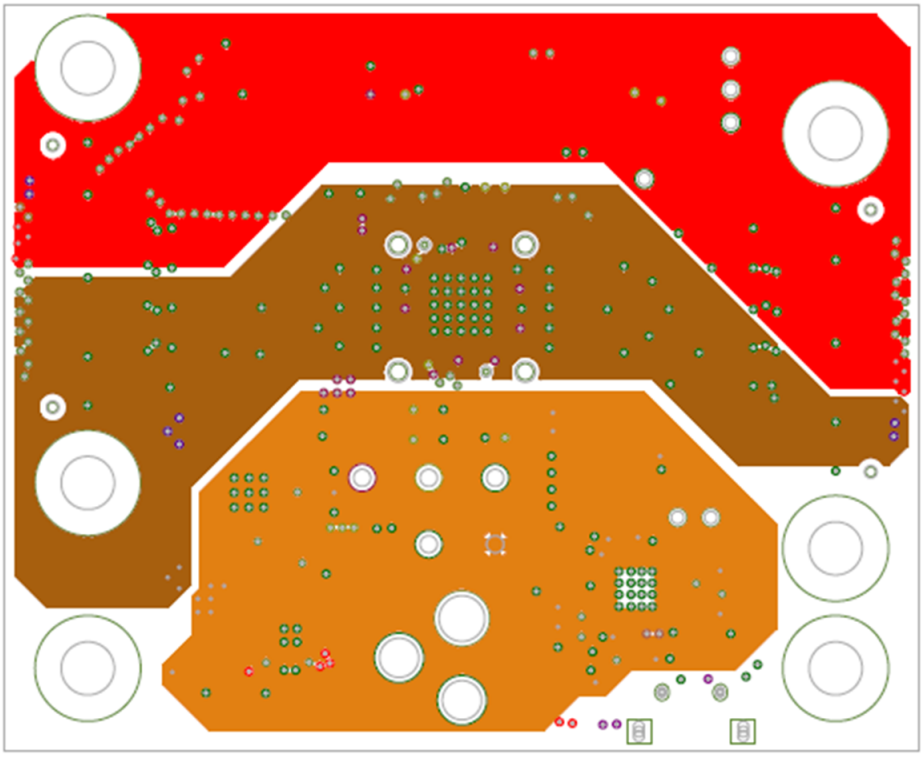


Figure 13. Layer 4 (Power)

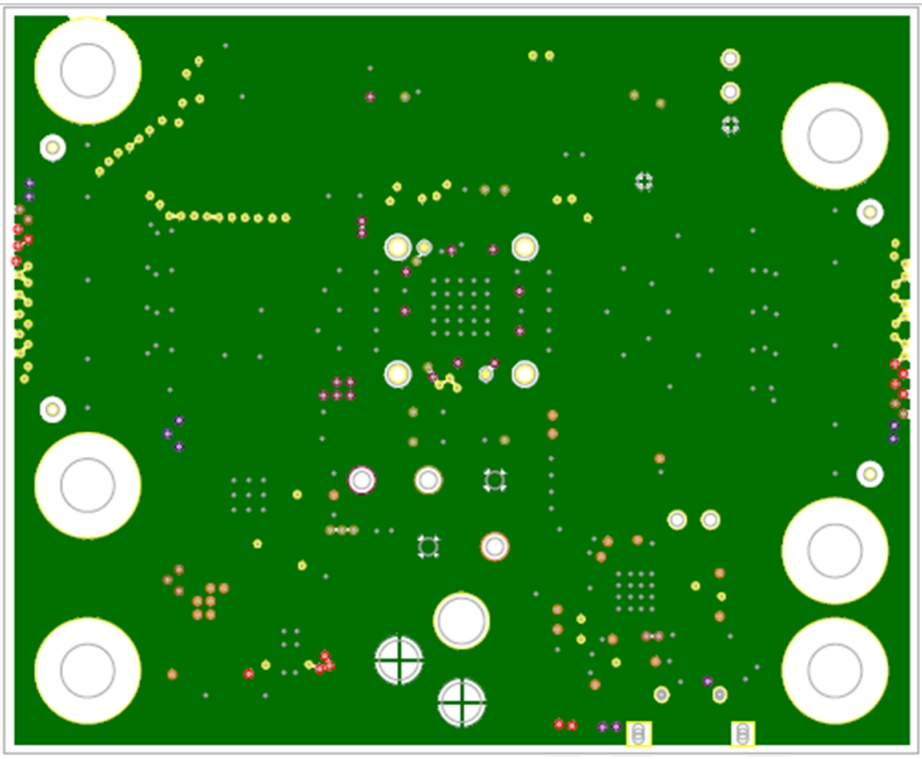


Figure 14. Layer 5 (GND)

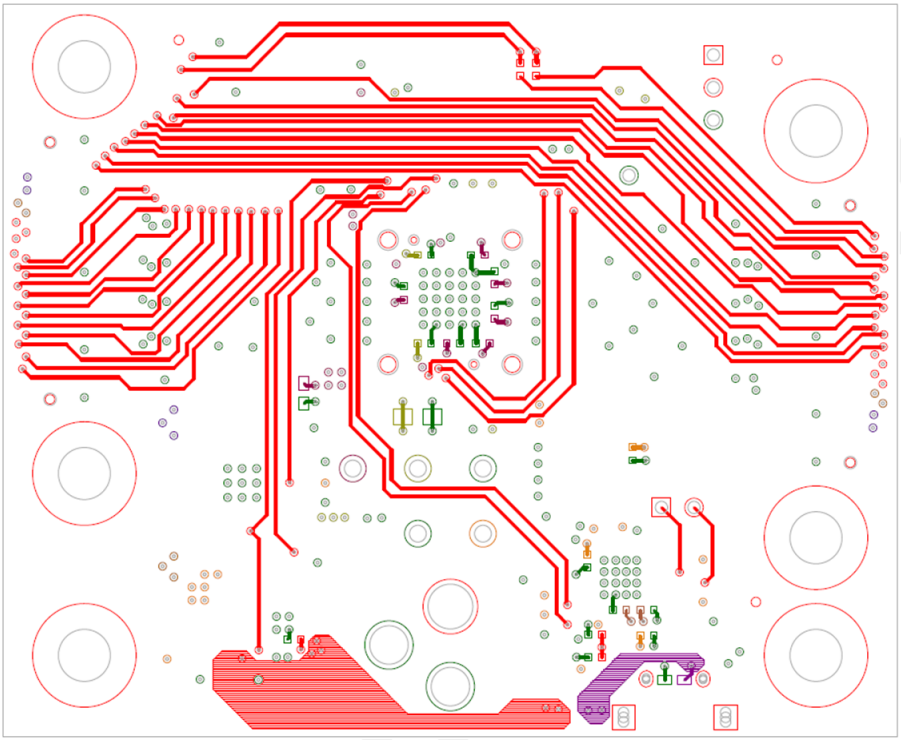


Figure 15. Layer 6 (Bottom)

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 are NOT certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

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

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】

本開発キットは技術基準適合証明を受けておりません。

本製品のご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

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。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

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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

電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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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8. *Limitations on Damages and Liability:*

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