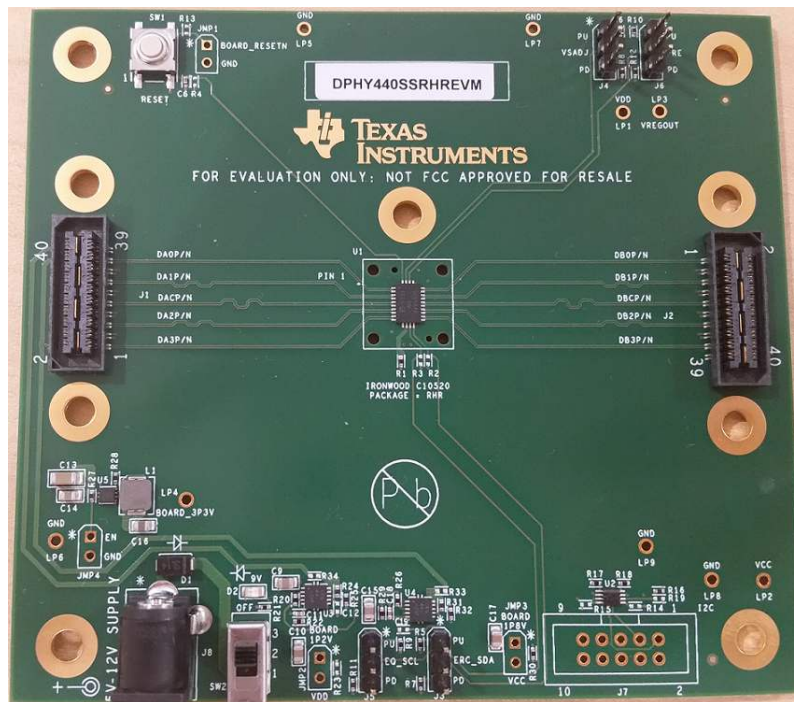


## **DPHY440SSRHREVM Users Guide v0.2**

This document describes how to use DPHY440SSRHREVM.

### **1 What is DPHY440SSRHREVM?**

The DPHY440SSRHREVM is designed to evaluate SN65DPHY440SSRHR device. The EVM has two SAMTEC connectors which provide a means to route DSI or CSI-2 data and clock into and out of the DPHY440.



**Figure 1. DPHY440SSRHREVM**

### **2 DPHY440SSRHREVM Features**

#### **2.1 Power**

The EVM can be powered 5 V – 12 V DC IN through a power jack J8 (2 mm positive tip, 6.5 mm negative outer shield).

Test loops and headers to power rails and GND are provided for test purposes. Some power rails can be isolated from main power supply by removing passive components. Refer to the schematics for power rail connection details. Do not supply external power through the test headers/loops unless the power rail has been isolated from other power sources.

## 2.2 Configuration Setting

The EVM has four headers which can be used to control DPHY440 settings like receiver equalization, transmitter voltage swing and pre-emphasis level. Refer to SN65DPHY440SS datasheet for details on configuration options and settings.

**Table 1. Configuration Options**

Reference Designator	Control Function	Default Setting	Description
J3	ERC/SDA	OPEN	Short J3.1 to J3.2: $V_{IH}$ J3 open: $V_{IM}$ Short J3.2 to J3.3: $V_{IL}$
J4	VSADJ_CFG0	OPEN	Short J4.1 to J4.2: $V_{IH}$ J4 open: $V_{IM}$ Short J4.2 to J4.3: $V_{IL}$
J5	EQ/SDA	OPEN	Short J5.1 to J5.2: $V_{IH}$ J5 open: $V_{IM}$ Short J5.2 to J5.3: $V_{IL}$
J6	PRE_CFG1	OPEN	Short J6.1 to J6.2: $V_{IH}$ J6 open: $V_{IM}$ Short J6.2 to J6.3:
SW1	RSTN	OPEN	Push to reset the DPHY440.

**NOTE:** SN65DPHY440SS RSTN must be toggled from low to high (via SW1) each time a header configuration is changed

## 2.3 I<sup>2</sup>C

If the configuration options listed in [Table 1](#) are not good enough, the SN65DPHY440 has a I<sup>2</sup>C slave interface which provides software access to additional configuration options. This I<sup>2</sup>C slave interface is available after DPHY440 has sampled all the 3-level inputs. The SN65DPHY440SSRNR 7-bit I<sup>2</sup>C address is 0x6C.

I<sup>2</sup>C bus can be accessed through headers: J3.2 (SDA) and J5.2 (SCL). External 4.7K pull-ups to 1.8 V on both of these pins should be employed when accessing DPHY440 I<sup>2</sup>C from these two pins.

A separate I<sup>2</sup>C header (J7) which matches the Total Phase Aardvark I<sup>2</sup>C controller dongle is also available on EVM. In order to use header J7, R14 and R15 must be populated with a 0-Ω resistor. Once these resistors are populated, the Total Phase Aardvark I<sup>2</sup>C controller dongle can be connected to J7. A user will need to install the J7 header on the EVM board.

**Table 2. J7 Pin-Out**

J7 Pin No.	Name	J7 Pin No.	Name
1	SCL at 3.3V levels	2	GND
3	SDA at 3.3V levels	4	NC
5	NC	6	NC
7	NC	8	NC
9	NC	10	GND

## 2.4 J1 – DSI/CSI-2 Input Connector (P/N QSH-020-01-H-D-DP-A)

Provided on the DPHY440 is a Samtec QSH type connector that can be mated with a matching QTH connector. This Samtec connector provides a means to route DSI or CSI-2 signals into the SN65DPHY440SSRHR. The mating connector part number is QTH-020-01-H-D-DP-A. There are third party solutions like the HDR-128291-XX breakout board from Samtec which can be used. The HDR-128291-XX is a breakout board with a mating connector to J1 and standard SMA male connectors. More info on this breakout board can be obtained from Samtec website. Another third party option is the ZX100 by Zebax Technologies. More information on this board can be obtained from Zebax website.

**Table 3. J1 Pin-Out**

Pin No.	Name	Pin No.	Name
1	DA3N	2	EQ/SCL
3	DA3P	4	ERC/SDA
5	GND	6	NC
7	GND	8	NC
9	DA2N	10	NC
11	DA2P	12	NC
13	GND	14	Board RSTN
15	GND	16	NC
17	DACN	18	NC
19	DACP	20	NC
21	GND	22	NC
23	GND	24	NC
25	DA1N	26	NC
27	DA1P	28	NC
29	GND	30	NC
31	GND	32	NC
33	DA0N	34	Board 1.8V
35	DA0P	36	Board 1.8V
37	NC	38	Board 1.2V
39	NC	40	Board 1.2V

## 2.5 J2 – DSI/CSI-2 Output Connector (P/N QSH-020-01-H-D-DP-A)

Provided on the DPHY440 is a Samtec QSH type connector that can be mated with a matching QTH connector. This Samtec connector provides a means to route DSI or CSI-2 signals out of the SN65DPHY440SSRHR. The mating connector part number is QTH-020-01-H-D-DP-A. There are third party solutions like the HDR-128291-XX breakout board from Samtec which can be used. The HDR-128291-XX is a breakout board with a mating connector to J1 and standard SMA male connectors. More info on this breakout board can be obtained from Samtec website. Another third party option is the ZX100 by Zebax Technologies. More information on this board can be obtained from Zebax website.

**Table 4. J2 Pin-Out**

Pin No.	Name	Pin No.	Name
1	DB0P	2	EQ/SCL
3	DB0N	4	ERC/SDA
5	GND	6	NC
7	GND	8	NC
9	DB1P	10	NC
11	DB1N	12	NC
13	GND	14	Board RSTN
15	GND	16	NC
17	DBCP	18	NC
19	DBCN	20	NC
21	GND	22	NC
23	GND	24	NC
25	DB2P	26	NC
27	DB2N	28	NC
29	GND	30	NC
31	GND	32	NC
33	DB3P	34	NC
35	DB3N	36	NC
37	NC	38	NC
39	NC	40	NC

## 2.6 LEDs

**Table 5. LEDs**

Reference Designator	LED Name	Description
D2	POWER	Illuminates if 5V - 12 Power is applied to DC-IN J8.

### 3 I<sup>2</sup>C Configuration Examples

This section provides configuration example of the DPHY440SSRHREVM using the Total Phase Aardvark I<sup>2</sup>C controller dongle.

```
<aardvark>
  <configure i2c="1" spi="1" gpio="0" tpower="1" pullups="0"/>
  <i2c_bitrate khz="100"/>

====RxEQ====<
<i2c_write addr="0x6C" count="1" radix="16">09 00</i2c_write>/>

====ERC====
i2c_write addr="0x6C" count="1" radix="16">0A FF</i2c_write>/>
i2c_write addr="0x6C" count="1" radix="16">0B FF</i2c_write>/>

====VSADJ and PRE====
<i2c_write addr="0x6C" count="1" radix="16">0E 11</i2c_write>/ >

</aardvark>
```

## 4 Bill of Materials

Item	Quantity	Reference	Part	Tolerance	Footprint	Manuf	Manuf PN
1	5	C1,C3,C4,C7,C8	0.1uF	10V, 10%	cc0402	Yageo	CC0402KRX5R6BB104
2	2	C2,C5	0.001uF	16V, 10%	cc0402	Kemet	C0402C102K4RACTU
3	1	C6	0.22uF	10V, 10%	cc0402	Taiyo Yuden	LMK105BJ224KV-F
4	4	C9,C10,C15,C17	10uF	6.3V, 10%	cc0805	Taiyo Yuden	JMK212B7106KG-T
5	2	C11,C18	0.01uF	25V, 10%	cc0402	Murata	GRM155R71E103KA01D
6	0	C12,C19	DNI_100nF	10V, 10%	cc0402	Yageo	CC0402KRX5R6BB104
7	1	C13	22uF	25V, 10%	cc1206	Murata	GRM31CR61E226KE15L
8	1	C14	10uF	25V, 10%	cc0805	Murata	GRM21BR61E106KA73L
9	1	C16	22uF	10V, 20%	cc0805	TDK	C2012X5R1A226M125AB
10	1	D1	40V, 1A		DO214AC	Comchip	CDBA140SL-HF
11	1	D2	LED Green 0805		r0805	Arrow (Lumex)	670-1006 (SML_LX0805GC)
12	0	JMP1,JMP2,JMP3,JMP4	DNI_2 Pin Berg Jumper		berg2	Sullins	PEC02SAAN
13	2	J1,J2	QSH-020-01		QSH-020_x	Samtec	QSH-020-01-X-D-DP-A
14	4	J3,J4,J5,J6	HDR3X1 M .1		HDR_THVT_1x3_100	3M	961103-6404-AR
15	0	J7	Header 5x2 0.1" thru-hole		con_thvt_shrd_2x5_100_m	3M	N2510-6002-RB
16	1	J8	2.1mm x 5.5mm		PJ-202AH	CUI STACK	PJ-202AH
17	0	LP1,LP2,LP3,LP4,LP5,LP6,LP7,LP8,LP9	LP		TESTLOOP	KOBIKONN	151-103-RC
18	1	L1	2.2uH		4p5x4mm	Vishay	IHLP1616ABER2R2M11
19	4	R1,R20,R26,R30	0	5%	r0402	Rohm	MCR01MRTJ000
20	0	R2,R3,R4,R14,R15,R19,R23,R33,R34	DNI_0	5%	r0402	Rohm	MCR01MRTJ000
21	6	R5,R9,R17,R18,R22,R29	4.7K	5%	r0402	Panasonic	ERJ-2GEJ472X
22	8	R6,R7,R8,R10,R11,R12,R16,R27	10K	5%	r0402	Panasonic	ERJ-2GEJ103X
23	0	R13	DNI_10K	5%	r0402	Panasonic	ERJ-2GEJ103X
24	1	R21	499	5%	r0402	Panasonic	ERJ-2RKF4990X
25	1	R24	2.49K	1%	r0402	Panasonic	ERJ-2RKF2491X
26	1	R25	4.99K	1%	r0402	Panasonic	ERJ-2RKF4991X
27	1	R28	100K	5%	r0402	Panasonic	ERJ-2GEJ104X
28	1	R31	3.57K	1%	r0402	Panasonic	ERJ-2RKF3571X
29	1	R32	2.87K	1%	r0402	Panasonic	ERJ-2RKF2871X
30	1	SW1	PB_SWITCH		SW_MOM_2NO	OMRON	B3SN-3012P
31	1	SW2	TS01CQE		TS01CQE	C7K Div.	TS01CQE
32	1	U1	SN65DPHY440SSRHRR		28_RHR	Texas Instruments	SN65DPHY440SSRHRR
33	1	U2	txs0102dcut		DCU8	Texas Instruments	TXS0102DCUT

(continued)

Item	Quantity	Reference	Part	Tolerance	Footprint	Manuf	Manuf PN
34	2	U3, U4	TPS74701		10_DRC	Texas Instruments	TPS74701DRCT
35	1	U5	TPS62162		8_DSG	Texas Instruments	TPS62162DSG
36	1	LBL1	"Thermal Transfer Printable Labels, 0.650"" W x 0.200"" H - 10,000 per roll"		'PCB Label 0.650"H x 0.200"W	Brady	THT-14-423-10

## 5 Schematics

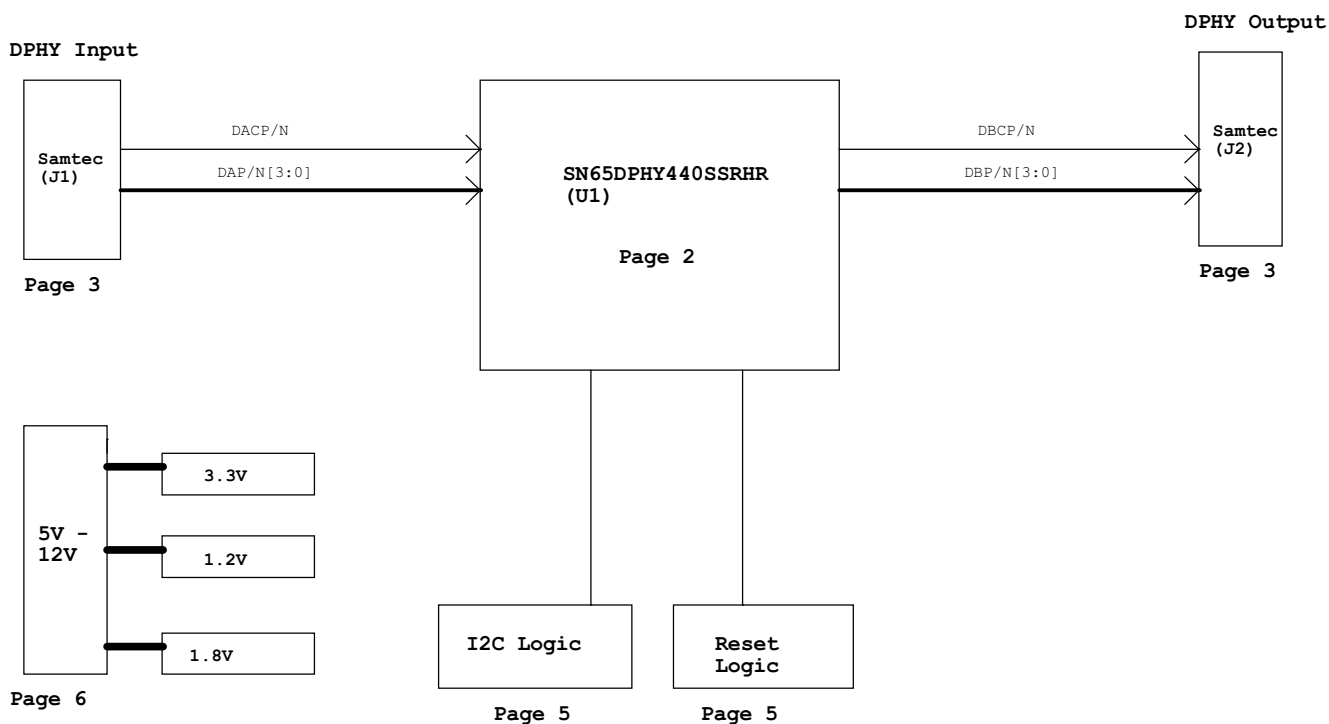


Figure 2. DPHY440SSRHREVM Page 1

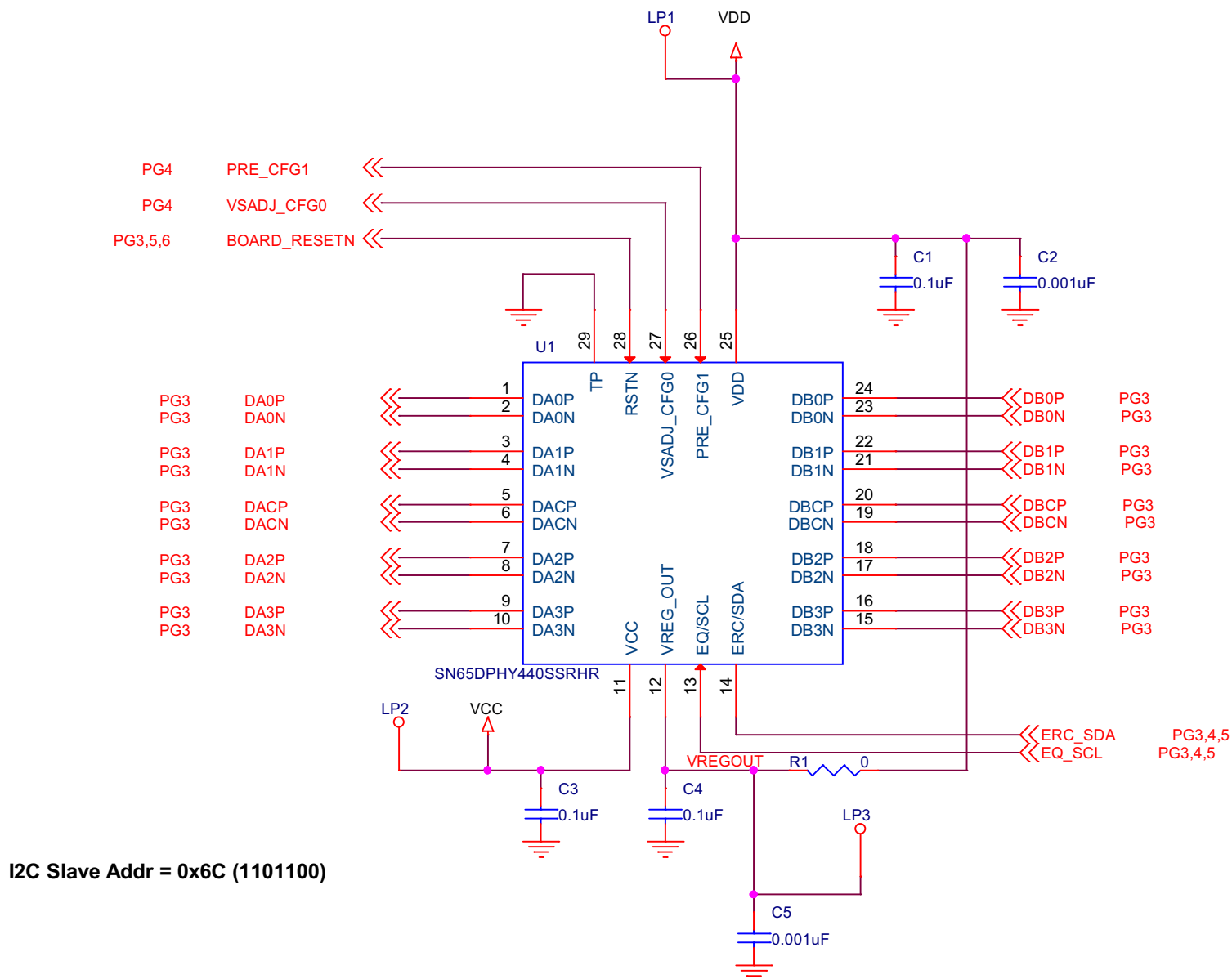


Figure 3. DPHY440SSRHREVM Page 2



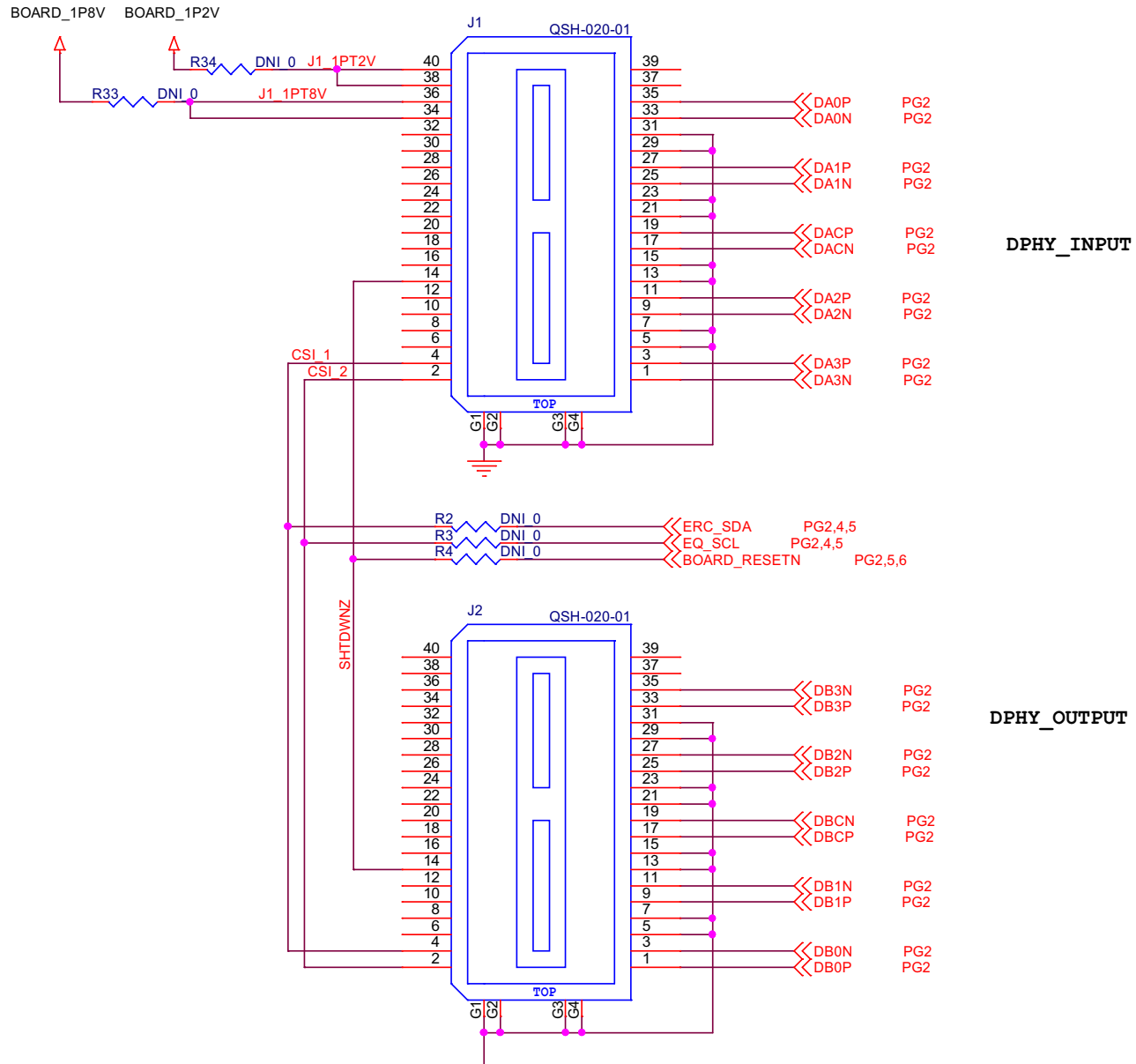


Figure 4. DPHY440SSRHREVM Page 3

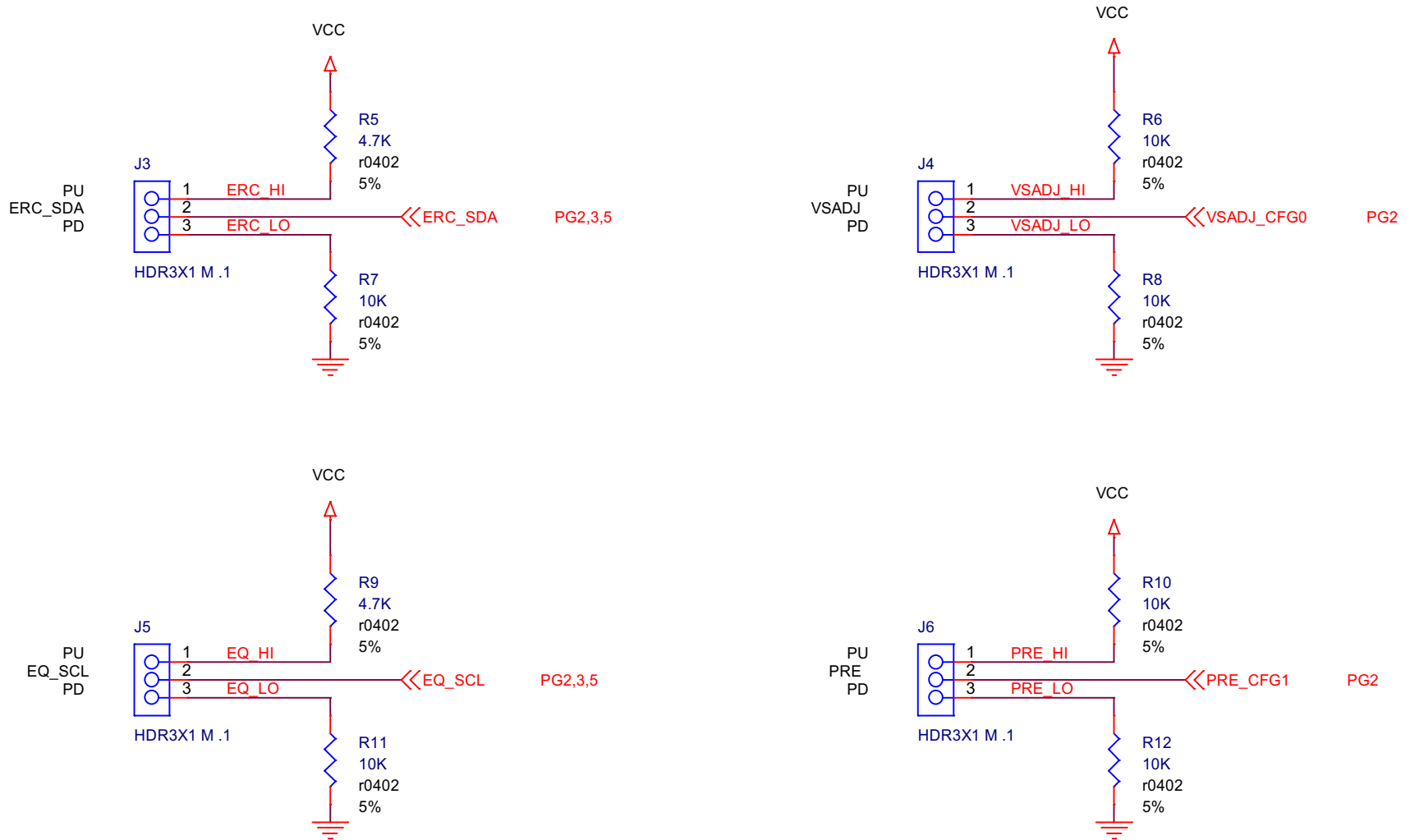


Figure 5. DPHY440SSRHREVM Page 4

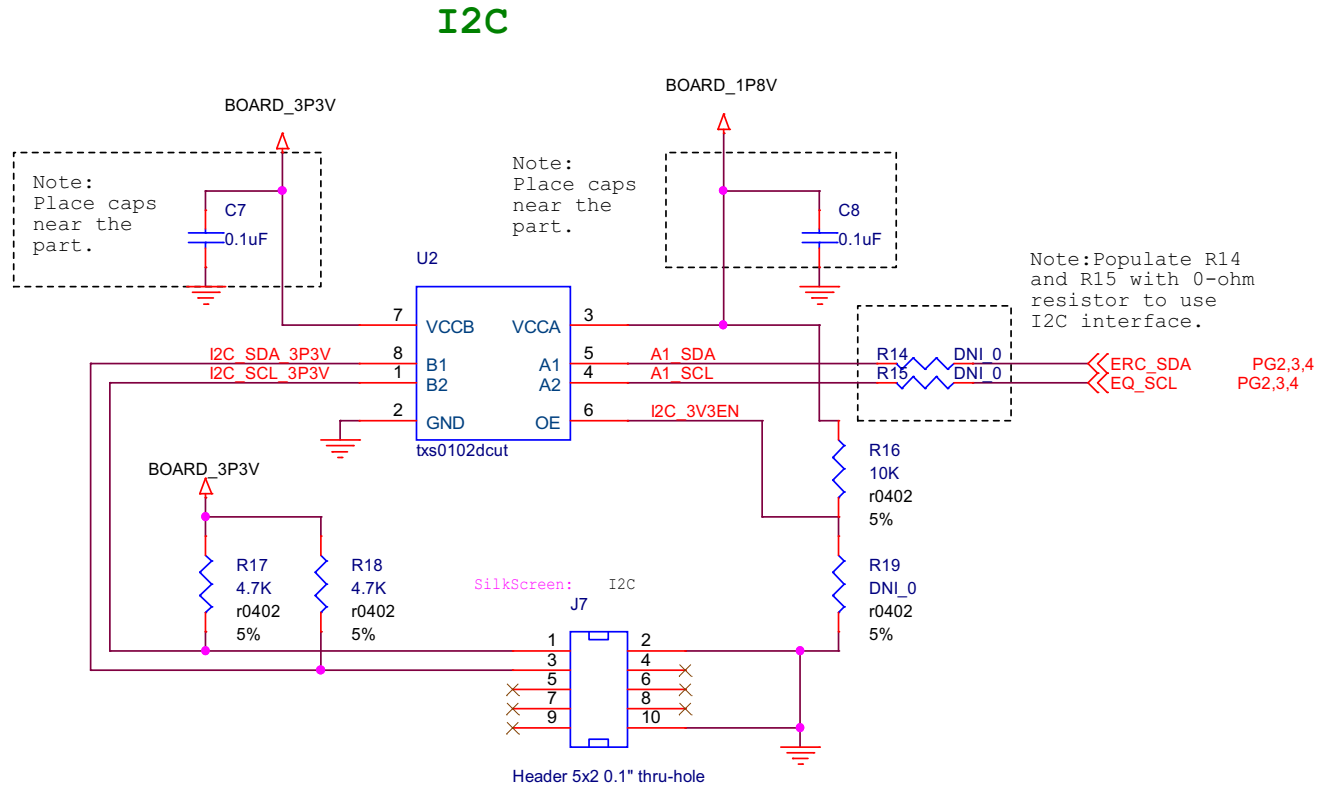
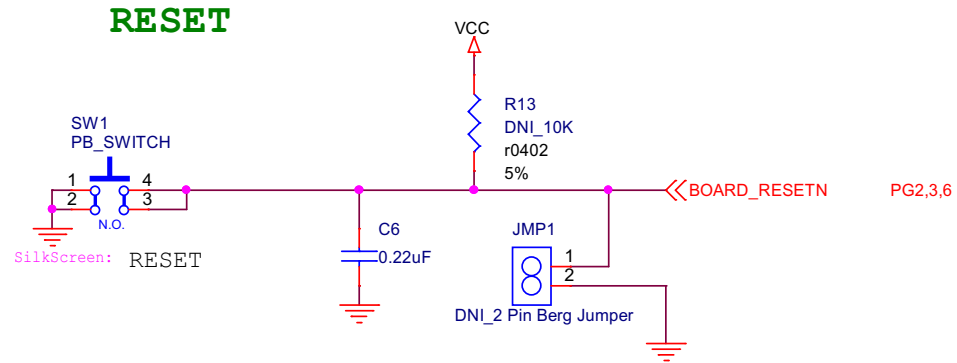


Figure 6. DPHY440SSRHREVM Page 5

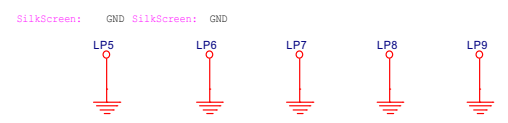
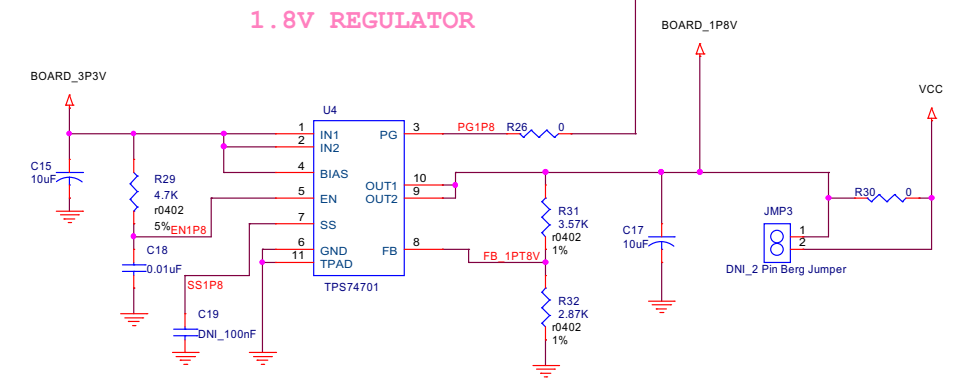
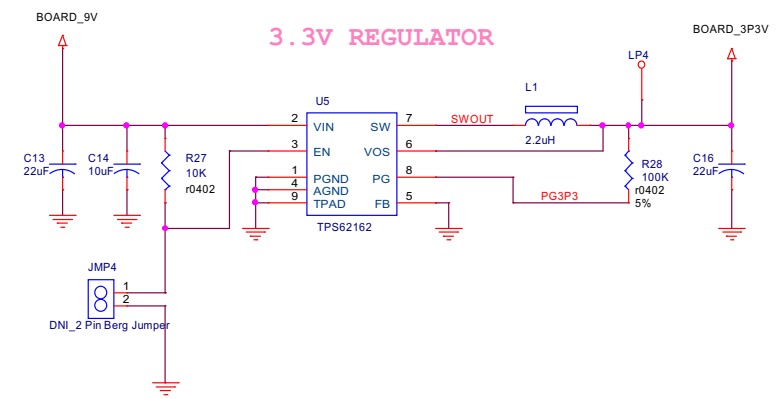
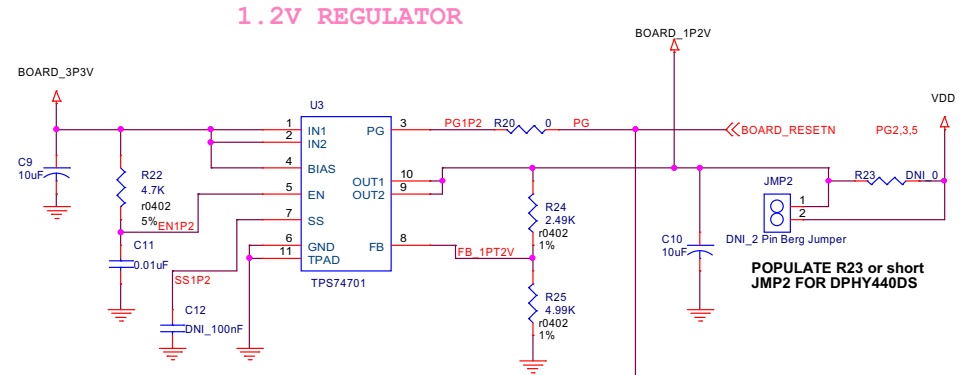
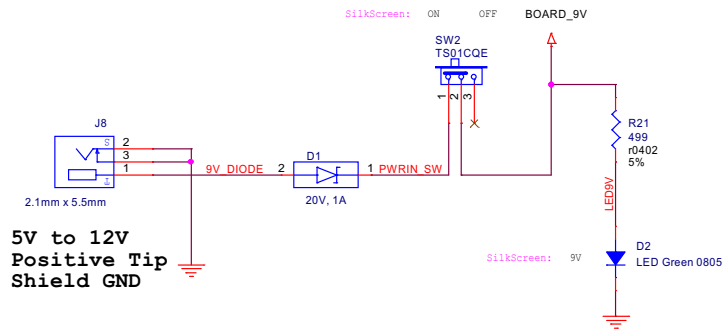


Figure 7. DPHY440SSRHREVM Page 6

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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.
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  - 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:*
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  - 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.
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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/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/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/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/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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#### 4 *EVM Use Restrictions and Warnings:*

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

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

#### 4.3 *Safety-Related Warnings and Restrictions:*

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