User's Guide

DP83867 Dual-Port TSN PCIe Application Interface Card

ABSTRACT

This user's guide describes the design, setup, and function of the DP83867 Dual-Port TSN PCIe Application Interface Card (AIC). The PCIe AIC supports two Ethernet ports with 1000/100/10 Mb/s and is compliant with the IEEE 802.3 standard. This reference design supports SGMII for MAC connections.

The AIC card can be interfaced to the Intel Tiger Lake H IoT and Alder Lake S reference design through the PCIe interface.

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Trademarks

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1 Introduction

1.1 Overview

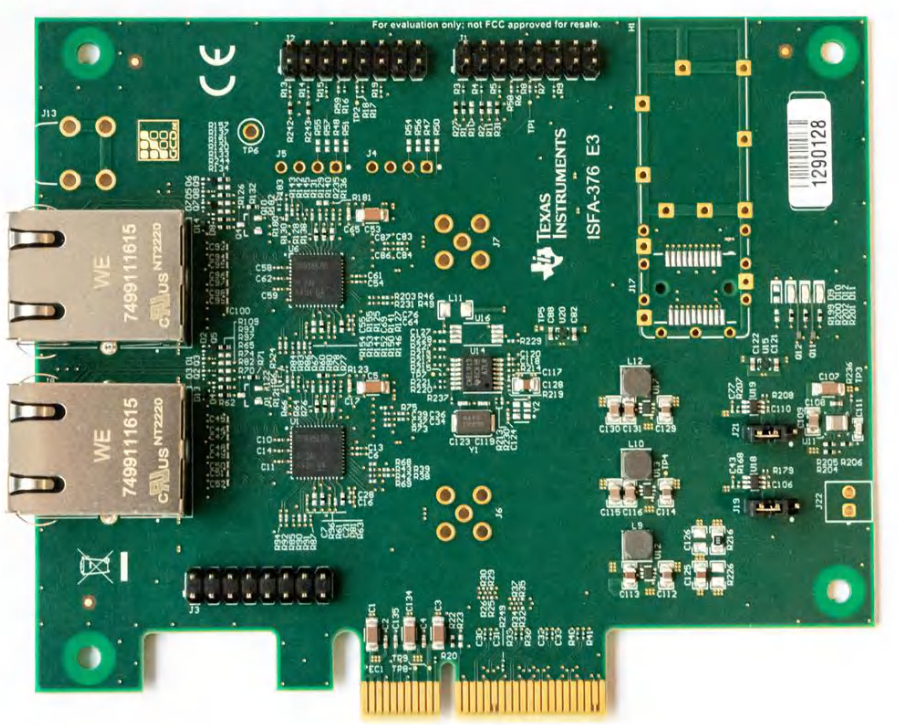

Figure 1-1. DP83867 Dual-Port TSN PCIe Application Interface Card (Top View)

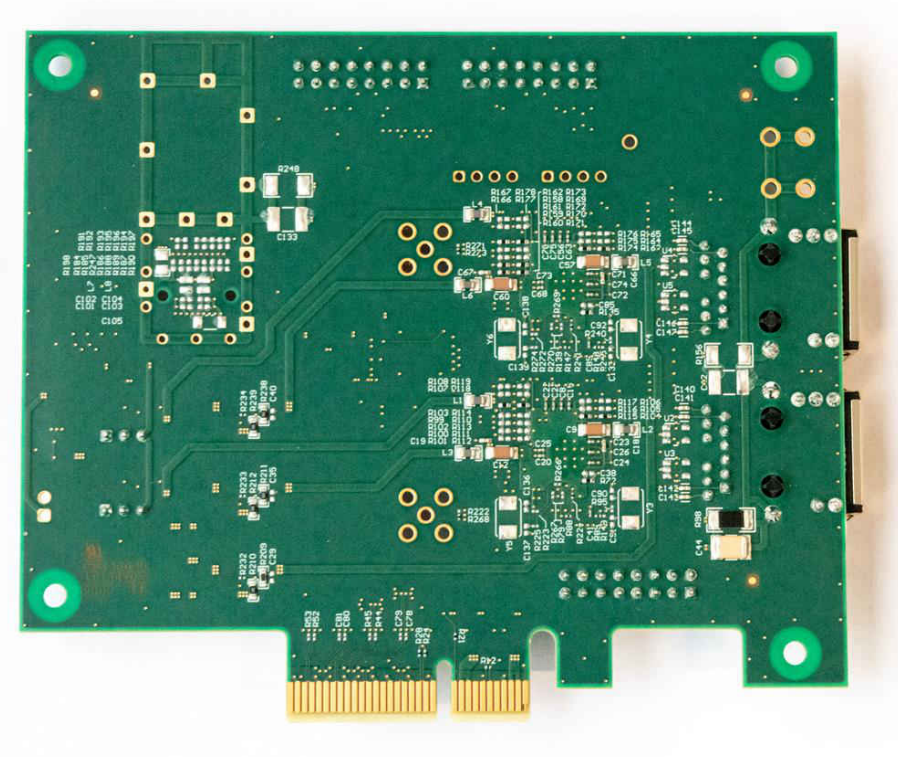

Figure 1-2. DP83867 Dual-Port TSN PCIe Application Interface Card (Bottom View)

The DP83867 Dual-Port TSN PCIe Application Interface Card plugs into the Intel Tiger Lake or Alder Lake reference design through the PCIe interface connector. This is an easy way to evaluate the functionality of the DP83867 Ethernet PHY with the Intel CPU reference design.

Note that the PCIe interface connector is used only as a form factor and uses proprietary interface signal assignment as given by the Intel reference design. The PCIe form factor carries the SGMII signaling for two Ethernet ports, MDIO/MDC, power supply and control signals.

The AIC supports MDIO access via dedicated a SMI interface over the PCIe interface. The two DP83867 PHYs use different MDIO addresses to be addressed via the common interface.

For easy testing and development purpose, the AIC card supports several pin headers for signal probing.

The AIC uses the two RJ45 jack LEDs to show PHY link and speed indication with one LED, and PHY data transfer activity with the second LED.

Note

The AIC card supports resistor and capacitor mounting options to deploy DP83869 Ethernet PHY instead of DP83867 on each Ethernet interface port by using the same PHY footprint on the PCB.

1.2 Hardware Features

DP83867 Dual-Port TSN PCIe Application Interface Card features:

- Two DP83867 Gbit Ethernet PHYs
- Two port SGMII MAC interface
- Common serial management interface (SMI) with MDIO/MDC signals to access both DP83867 Ethernet PHYs
- Two RJ45 jack connector with integrated magnetics
- Two LEDs in each RJ45 jack giving status information for different PHY operation modes
- On-board power generation for all PHYs, sourced by 5 V power supply through the PCIe connector

1.3 Software Features

- All Ethernet PHY MDIO registers can be accessed via PCIe interface.
  - DP83867 on Ethernet port 1 has MDIO address #0
  - DP83867 on Ethernet port 2 has MDIO address #1

1.4 Block Diagram

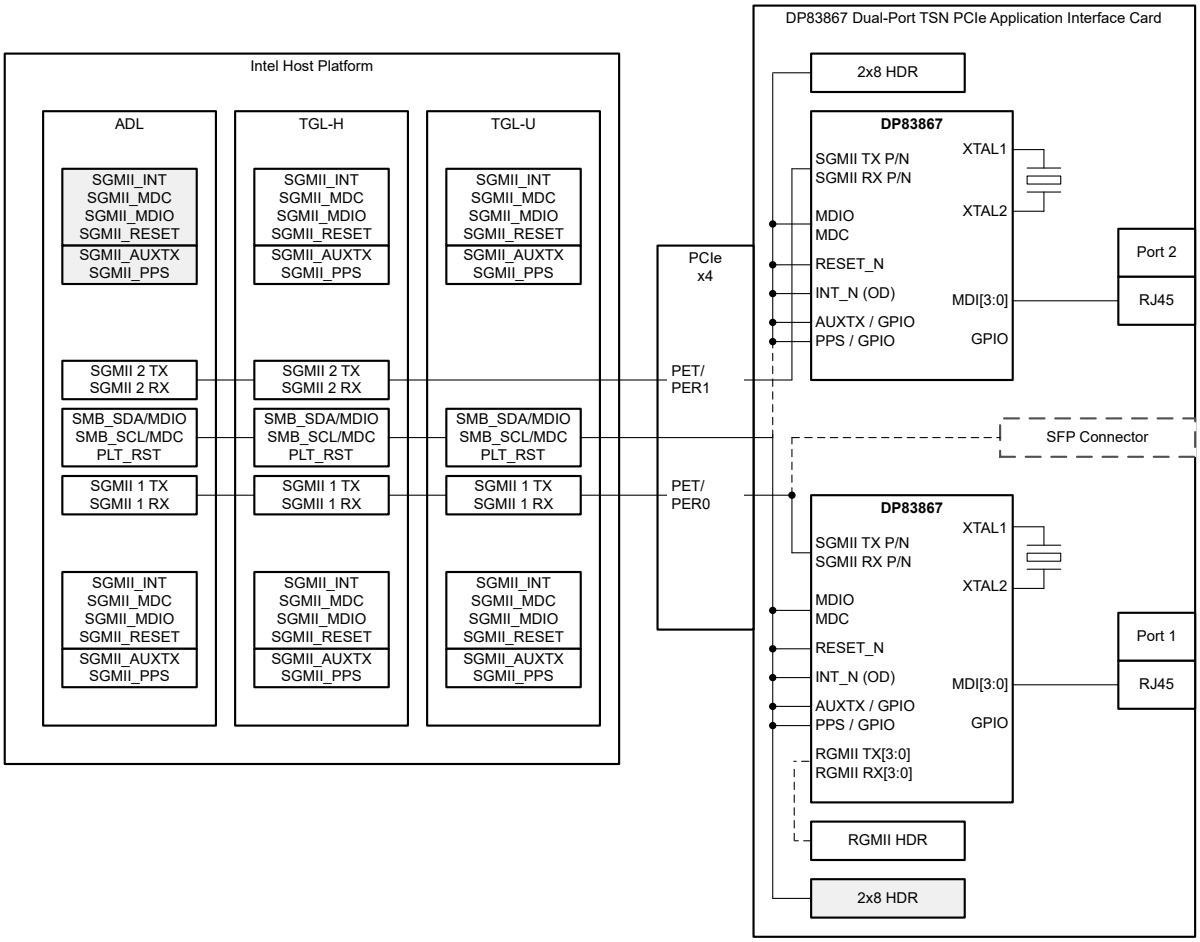

Figure 1-3. Block Diagram

2 Board Overview

2.1 Components

Figure 2-1 below gives a quick overview of the AIC board. The marked sections are described in the Table 2-1.

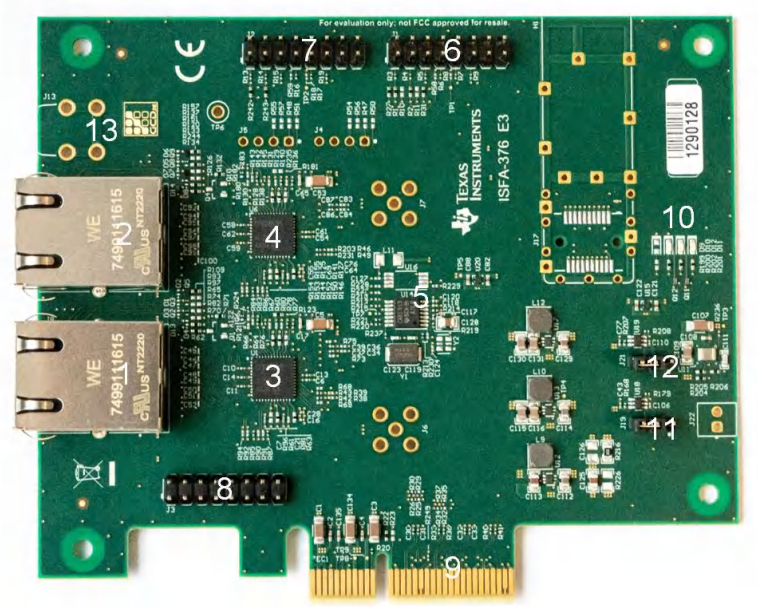

Figure 2-1. Connectors, Jumpers and LEDs

Table 2-1. Component Table

Section	Description
1	RJ45 with integrated magnetic G-Bit network connection Port 1 / TSN_0
2	RJ45 with integrated magnetic G-Bit network connection Port 2 / TSN_1
3	DP83867 PHY1 for Port 1
4	DP83867 PHY2 for Port 2
5	25 MHz clock generation for both PHYs
6	Signal connector MISC0 for validation
7	Signal connector MISC1 for validation
8	Signal connector RGMII interface (optional)
9	PCIe interface
10	Power indicator LEDs. • D10: 3.3V indicator • D11: VDDIO indicator PHY1 • D12: VDDIO indicator PHY2 • D9: 3.3V indicator for optional SFP+ module
11	VDDIO voltage selector jumper pin-header • J19: PHY 1 – Pin 1-2: 3.3V – Pin 2-3: 1.8V (default)
12	VDDIO voltage selector jumper pin-header • J21: PHY 1 – Pin 1-2: 3.3V – Pin 2-3: 1.8V (default)
13	Shield/Earth GND for testing.

2.2 PCIe Header Signals

Please refer to the schematics in section Section 4.2 for the PCIe signal assignment and description. The signal assignment is following the signal layout of the Intel host platform.

2.2.1 MISC0 Signal Header

The MSIC0 signal header is for debug purpose.

Table 2-2. MISC0 Signal Header for PHY1

Pin Number	Signal Description
1	MDC PHY1
3	MDIO PHY1
5	Interrupt PHY1
7	AUXTS PHY1 (Start-of-Frame time stamp)
9	PPS PHY1 (not supported by AIC)
11	Reset PHY1
13, 15	Not connected
2, 4, 6, 8, 10, 12, 14, 16	GND

2.2.2 MISC1 Signal Header

The MSIC1 signal header is for debug purposes.

Table 2-3. MISC1 Signal Header for PHY2

Pin Number	Signal Description
1	MDC PHY2
3	MDIO PHY2
5	Interrupt PHY2
7	AUXTS PHY2 (Start-of-Frame time stamp)
9	PPS PHY2 (not supported by AIC)
11	Reset PHY2
13, 15	Not connected
2, 4, 6, 8, 10, 12, 14, 16	GND

2.2.3 RGMII Signal Header

RGMII signal header for PHY1 can be used to connect PHY1 via separate cable connection.

Table 2-4. RGMII Signal Header for PHY1

Pin Number	Signal Description
1	TXCLK
2	RXCLK
3	TXCTL
4	RXCTL
7	TXDATA_3
8	RXDATA_3
9	TXDATA_2
10	RXDATA_2
11	TXDATA_1
12	RXDATA_1

Table 2-4. RGMII Signal Header for PHY1 (continued)

Pin Number	Signal Description
13	TXDATA_0
14	RXDATA_0
5, 6, 15, 16	GND

3 Quick Start

1. Power down the Intel host platform (Intel Tiger Lake UP3, Tiger Lake H IoT or Alder Lake S).
2. Plug-in the DP83867 Dual-Port TSN PCIe Application Interface Card into the Intel host platform.
3. Power up the Intel host platform.

4 Schematic, Board Layout, and Bill of Materials

4.1 Board Layout

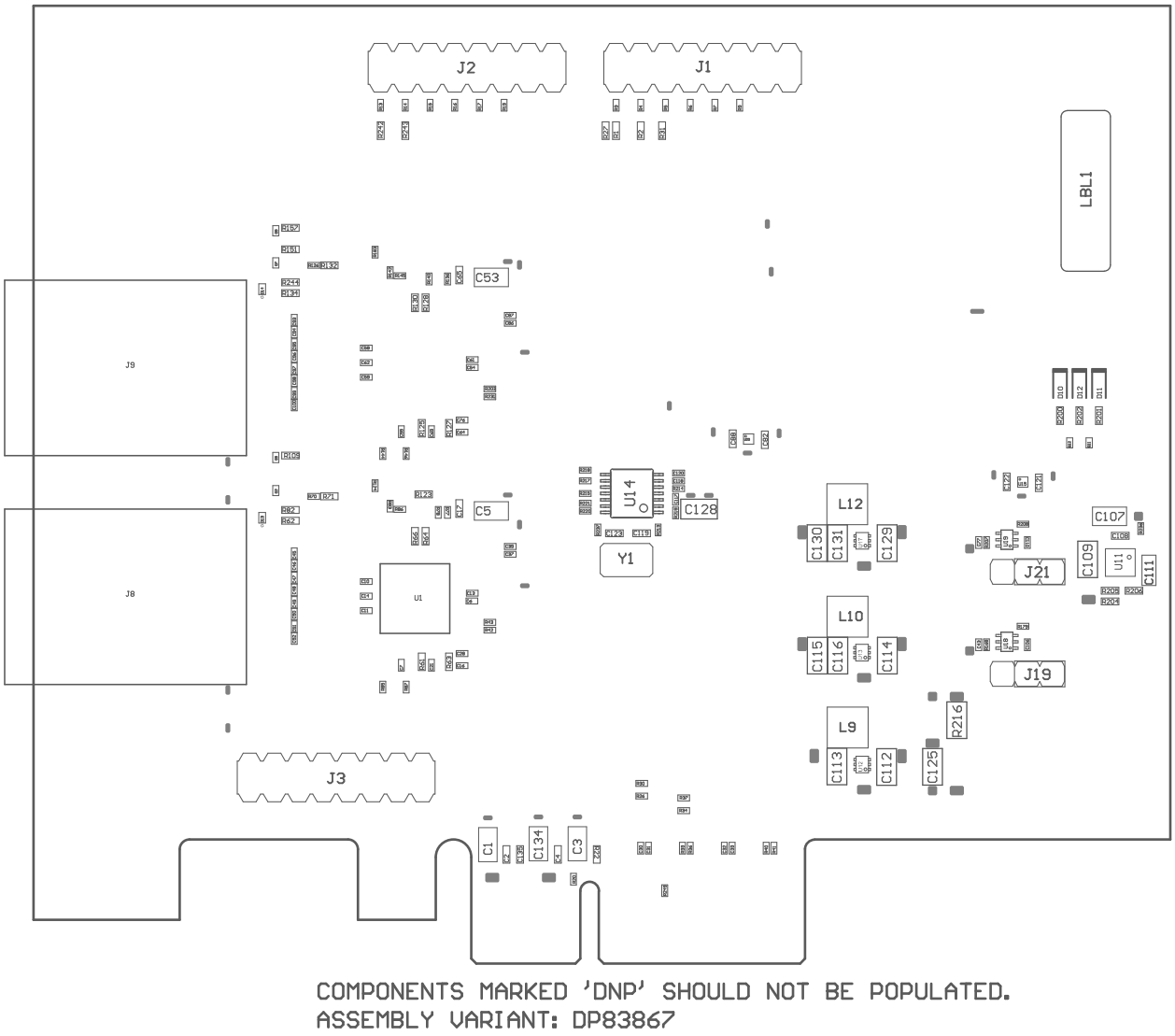

Figure 4-1. Assembly Drawing Top Layer

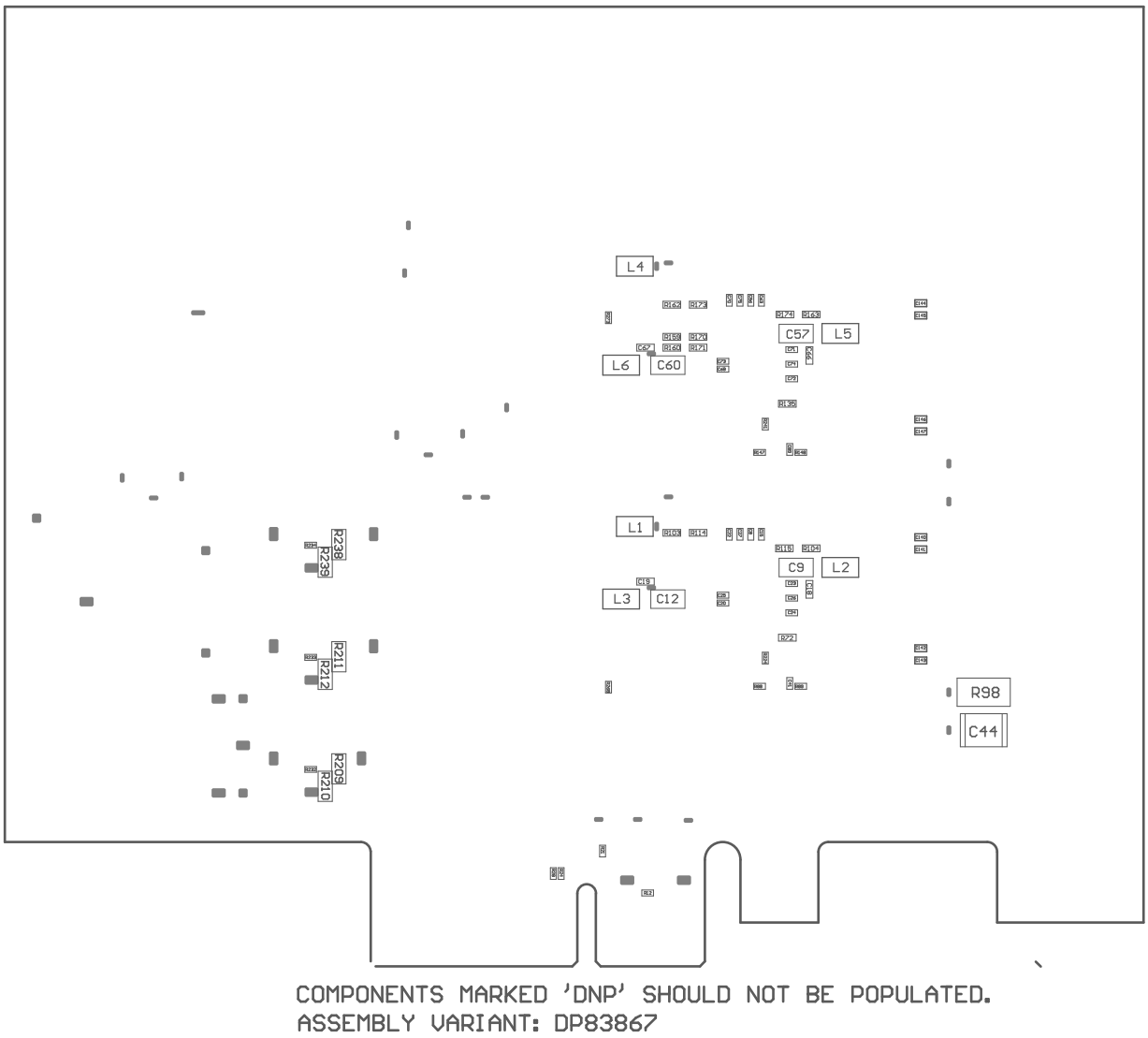

Figure 4-2. Assembly Drawing Bottom Layer

4.2 Schematic

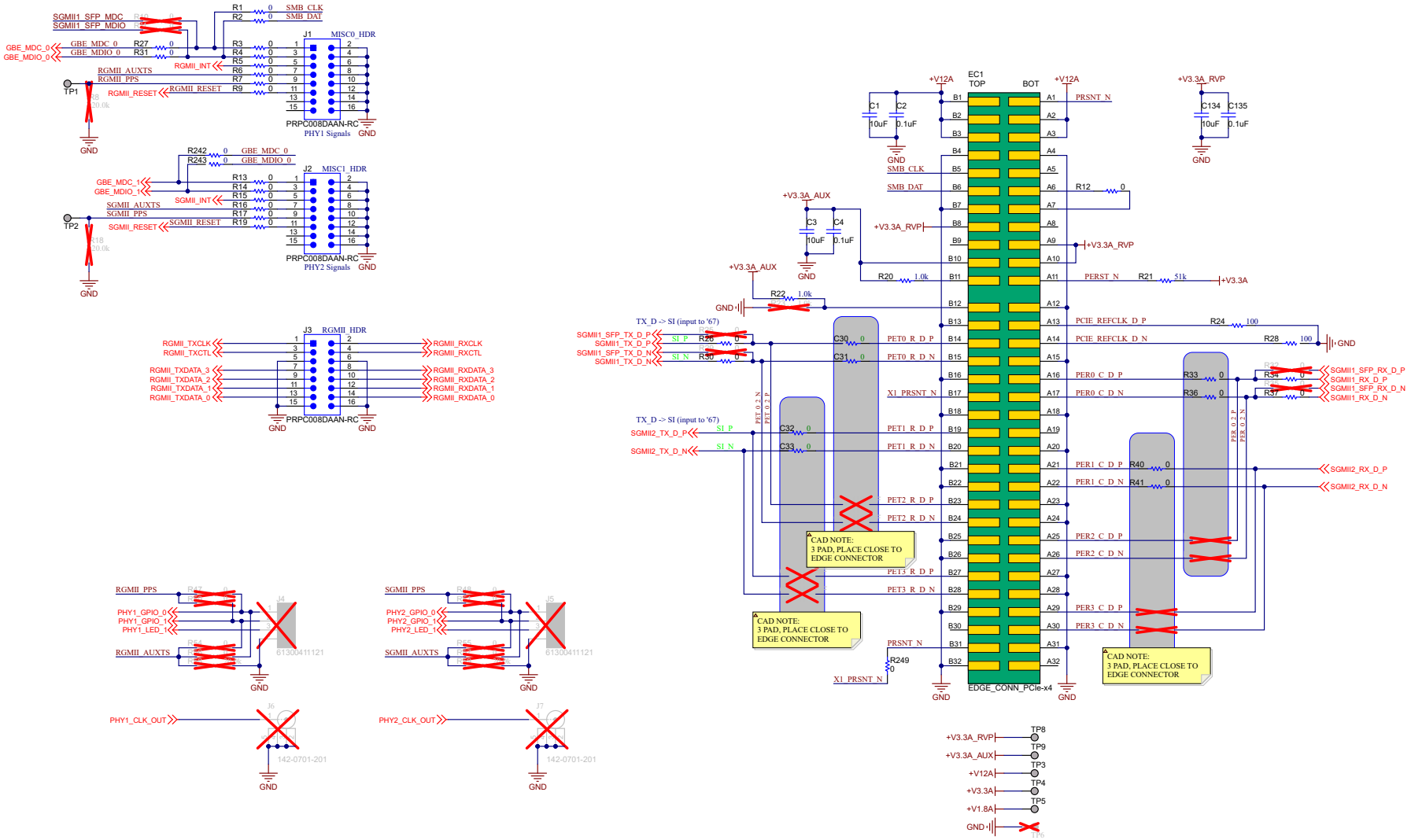

Figure 4-3. Schematic : PCIe Host Interface

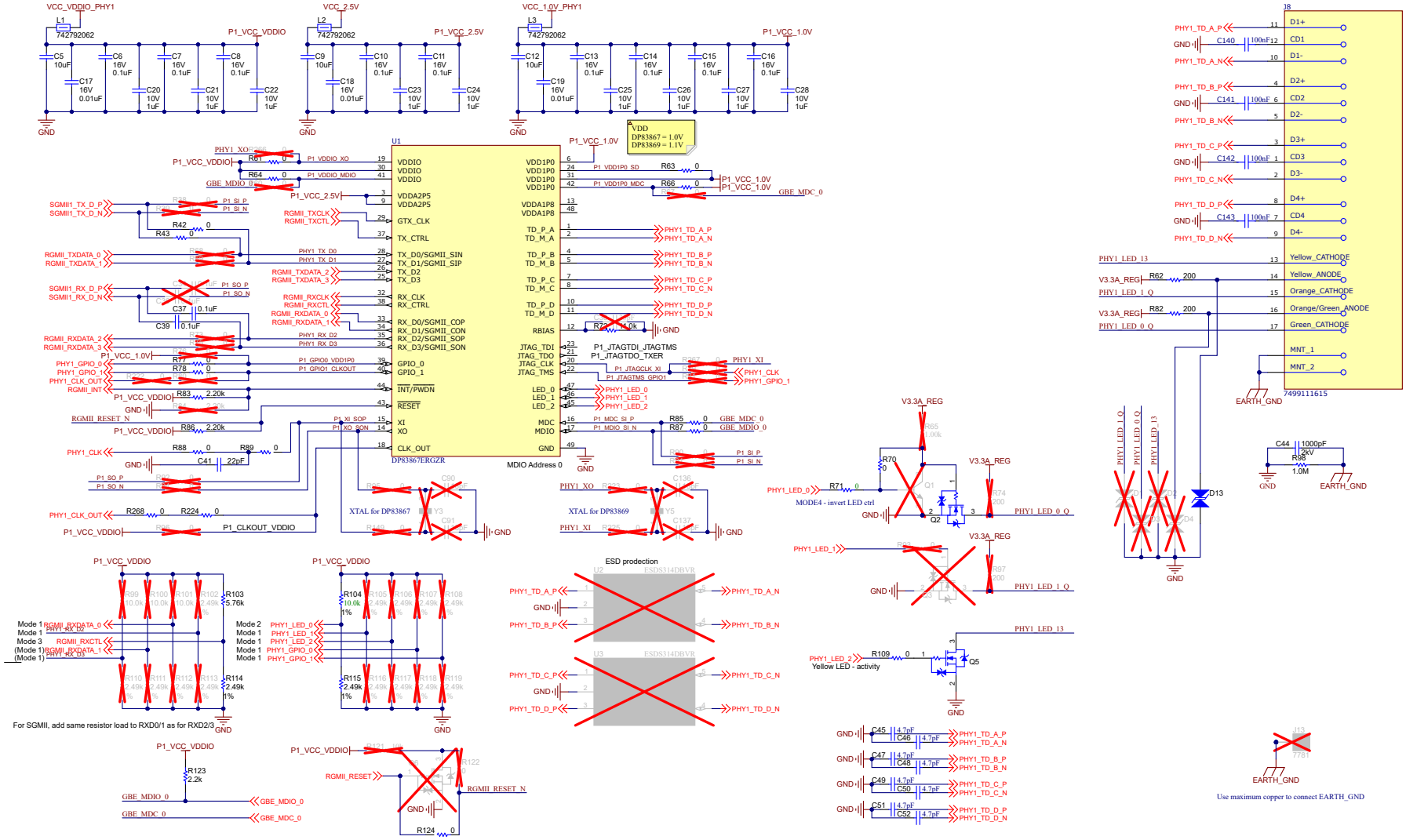

Figure 4-4. Schematic : DP83867 Ethernet PHY #1

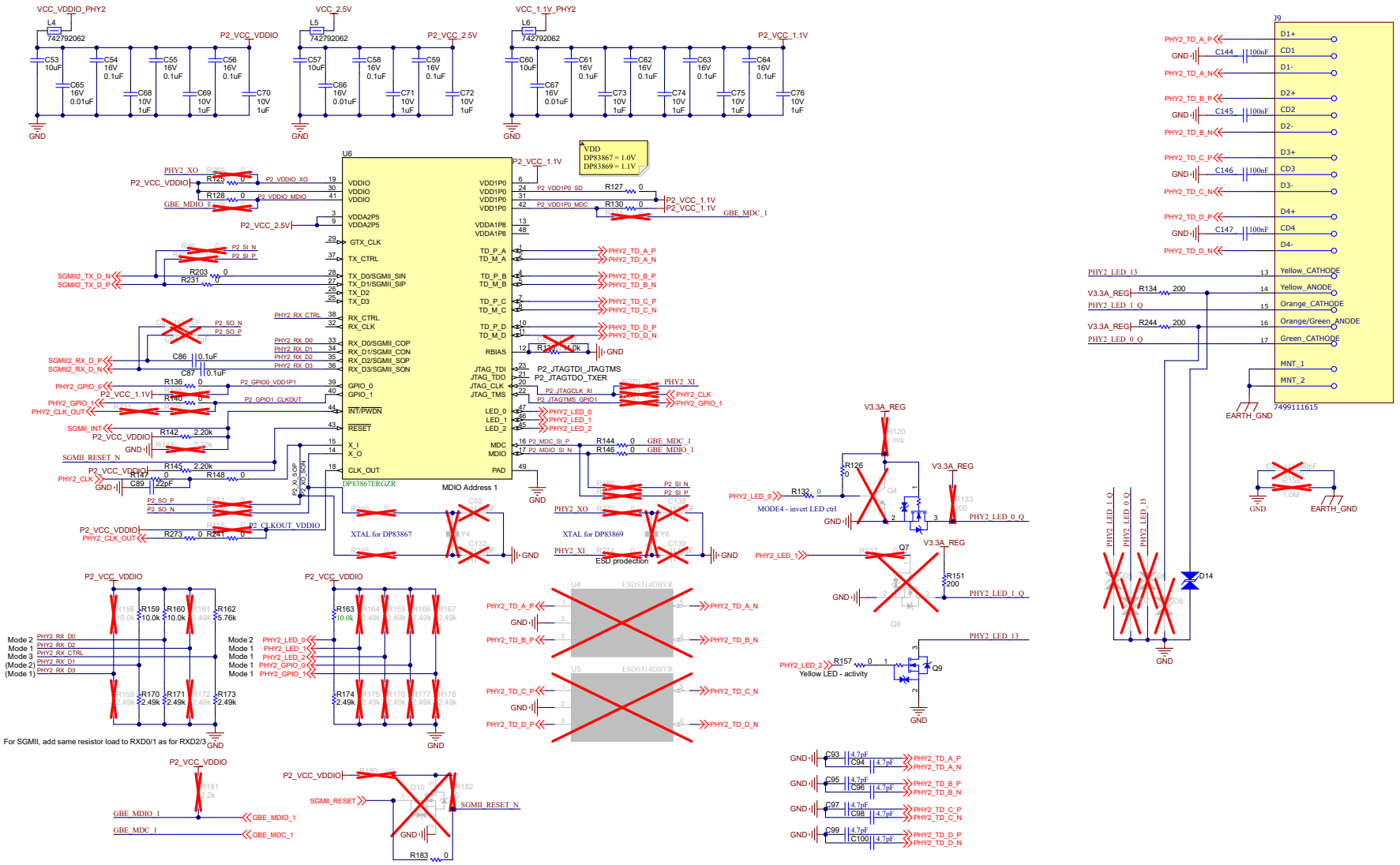

Figure 4-5. Schematic : DP83867 Ethernet PHY #2

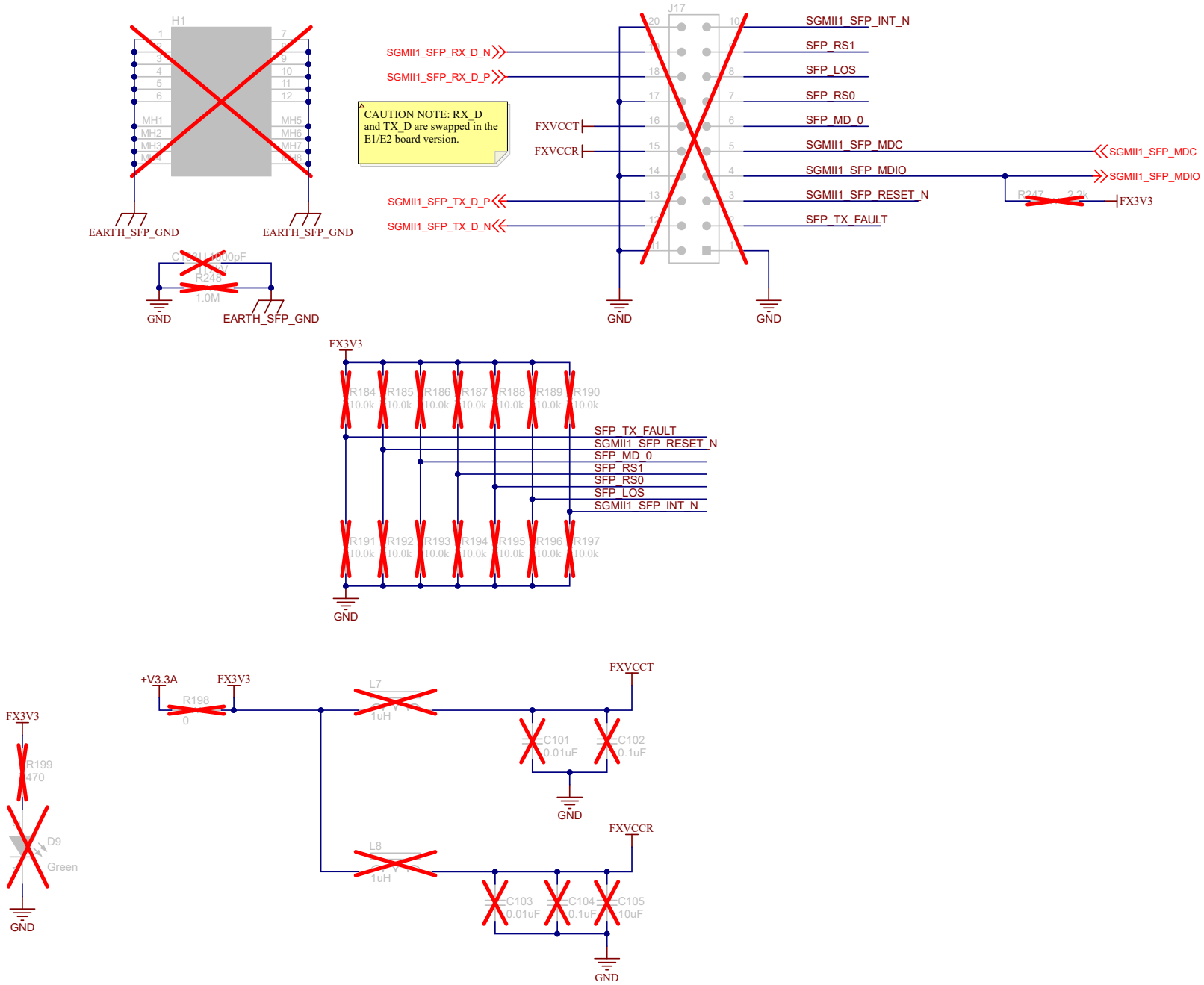

Figure 4-6. Schematic : Ethernet Fiber interface

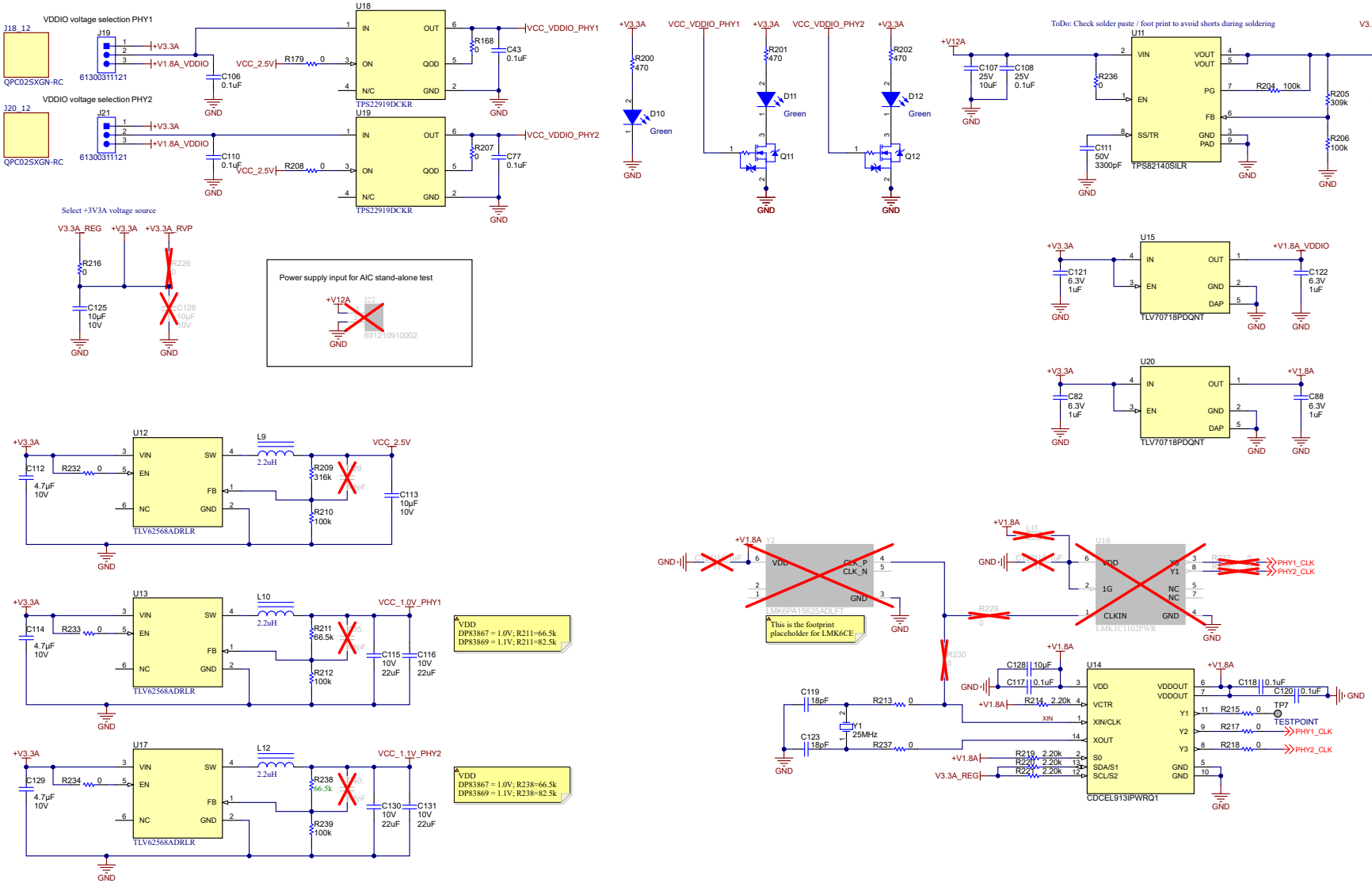

Figure 4-7. Schematic : Power, Clock and Configuration

4.3 Bill of Materials

Table 4-1. Bill of Materials

Designator	Qty	Part Number	Description	Footprint
C1, C3, C107, C134	4	C3216X7R1E106M160AE	CAP, CERM, 10 uF, 25 V, +/- 20%, X7R, 1206_190	1206_190
C2, C4, C108, C135	4	GRM155R71E104KE14D	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0402	0402
C5, C9, C12, C53, C57, C60	6	C3216X7R1V106M160AC	CAP, CERM, 10 uF, 35 V, +/- 20%, X7R, 1206_190	1206_190
C6, C7, C8, C10, C11, C13, C14, C15, C16, C37, C39, C43, C54, C55, C56, C58, C59, C61, C62, C63, C64, C77, C86, C87, C106, C110, C117, C118, C120	29	GRM033C71C104KE14D	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X5R, 0201	0201
C17, C18, C19, C65, C66, C67	6	885012205031	CAP, CERM, 0.01 uF, 16 V, +/- 10%, X7R, 0402	0402
C20, C21, C22, C23, C24, C25, C26, C27, C28, C68, C69, C70, C71, C72, C73, C74, C75, C76	18	GRM033R61A105ME15D	CAP, CERM, 1 uF, 10 V,+/- 20%, X5R, 0201	0201
C30, C31, C32, C33, R3, R4, R5, R6, R7, R9, R12, R13, R14, R15, R16, R17, R19, R26, R30, R33, R34, R36, R37, R40, R41, R42, R43, R70, R77, R78, R85, R87, R88, R89, R124, R126, R136, R140, R144, R146, R147, R148, R168, R179, R183, R203, R207, R208, R213, R215, R217, R218, R224, R231, R232, R233, R234, R236, R237, R241, R249, R268, R273	63	CRCW02010000Z0ED	RES, 0, 5%, 0.05 W, 0201	0201
C41, C89	2	GCM0335C1E220JD03D	CAP, CERM, 22 pF, 25 V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0201	0201
C44	1	1812GC102KA1	CAP, CERM, 1000 pF, 2000 V, +/- 10%, X7R, 1812	1812
C45, C46, C47, C48, C49, C50, C51, C52, C93, C94, C95, C96, C97, C98, C99, C100	16	GRM0335C1H4R7CA01D	CAP, CERM, 4.7 pF, 50 V, +/- 5%, C0G/NP0, 0201	0201
C82, C88, C121, C122	4	GRM155R70J105MA12D	CAP, CERM, 1 uF, 6.3 V, +/- 20%, X7R, 0402	0402
C109, C115, C116, C130, C131	5	C2012X7S1A226M125AC	CAP, CERM, 22 uF, 10 V, +/- 20%, X7S, 0805	0805
C111	1	GRM1885C1H332JA01D	CAP, CERM, 3300 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603
C112, C114, C129	3	LMK212B7475KG-T	CAP, CERM, 4.7 uF, 10 V, +/- 10%, X7R, 0805	0805
C113, C125, C128	3	C2012X7R1A106M125AC	CAP, CERM, 10 uF, 10 V, +/- 20%, X7R, 0805	0805
C119, C123	2	GRM1555C1H180JA01D	CAP, CERM, 18 pF, 50 V, +/- 5%, C0G/NP0, 0402	0402
C140, C141, C142, C143, C144, C145, C146, C147	8	885012205086	100 nF ±10% 50 V Ceramic Capacitor X7R 0402 (1005 Metric)	0402
D10, D11, D12	3	150060VS75000	LED, Green, SMD	LED_0603
D13, D14	2	TPD1E1B04DPYR	1-Channel ESD Protection Diode With Low Dynamic Resistance and Low Clamping Voltage, DPY0002A (X1SON-2)	DPY0002A

Table 4-1. Bill of Materials (continued)

Designator	Qty	Part Number	Description	Footprint
FID1, FID2, FID3, FID4, FID5, FID6	6	N/A	Fiducial mark. There is nothing to buy or mount.	N/A
J1, J2, J3	3	PRPC008DAAN-RC	Header, 2.54mm, 8x2, Gold, TH	Header, 2.54mm, 8x2, TH
J8, J9	2	7499111615	WE-RJ45 LAN Transformer 1000 Base-T	CONN_RJ45
J18_12, J20_12	2	QPC02SXGN-RC		JUMPER
J19, J21	2	61300311121	Header, 2.54 mm, 3x1, Gold, TH	Header, 2.54mm, 3x1, TH
L1, L2, L3, L4, L5, L6	6	742792062	Ferrite Bead, 80 ohm @ 100 MHz, 0.5 A, 0805	0805
L9, L10, L12	3	SDER041H-2R2MS	Inductor, 2.2 uH, 2.8 A, 0.045 ohm, SMD	4x4mm
LBL1	1	THT-14-423-10	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch
Q2, Q5, Q7, Q9, Q11, Q12	6	CSD13383F4	MOSFET, N-CH, 12 V, 2.9 A, YJC0003A (PICOSTAR-3)	YJC0003A
R1, R2, R27, R31, R71, R109, R132, R157, R242, R243	10	CRCW04020000Z0ED	RES, 0, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R20	1	RC0201JR-7D1KL	RES, 1.0 k, 5%, 0.05 W, 0201	0201
R21	1	RC0201JR-0751KL	RES, 51 k, 5%, 0.05 W, 0201	0201
R22	1	CRCW04021K00JNED	RES, 1.0 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R24, R28	2	RC0201JR-7D100RL	RES, 100, 5%, 0.05 W, 0201	0201
R61, R63, R64, R66, R125, R127, R128, R130	8	CRCW04020000Z0EDHP	RES, 0, 0%, 0.2 W, AEC-Q200 Grade 0, 0402	0402
R62, R82, R134, R151, R244	5	CRCW0402200RFKED	RES, 200, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R72, R135	2	CRCW040211K0FKED	RES, 11.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R83, R86, R142, R145, R214, R219, R220, R221	8	CRCW02012K20FKED	RES, 2.20 k, 1%, 0.05 W, 0201	0201
R98	1	CRCW20101M00JNEF	RES, 1.0 M, 5%, 0.75 W, AEC-Q200 Grade 0, 2010	2010
R103, R162	2	CRCW04025K76FKED	RES, 5.76 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R104, R159, R160, R163	4	CRCW040210K0FKED	RES, 10.0 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R114, R115, R170, R171, R173, R174	6	CRCW04022K49FKED	RES, 2.49 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R123	1	CRCW04022K20JNED	RES, 2.2 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R200, R201, R202	3	CRCW0402470RJNED	RES, 470, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R204, R206	2	CRCW0402100KFKED	RES, 100 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R205	1	CRCW0402309KFKED	RES, 309 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	0402
R209	1	CRCW0603316KFKEA	RES, 316 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
R210, R212, R239	3	CRCW0603100KFKEA	RES, 100 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603

Table 4-1. Bill of Materials (continued)

Designator	Qty	Part Number	Description	Footprint
R211, R238	2	CRCW060366K5FKEA	RES, 66.5 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603
R216	1	CRCW08050000Z0EAHP	RES, 0, 5%, 0.333 W, AEC-Q200 Grade 0, 0805	0805
U1	1	DP83867ERGZR	Robust, High Immunity, Small Form Factor 10/100/1000 Ethernet Physical Layer Transceiver	VQFN48
U6	1	DP83867ERGZR	Gigabit Ethernet PHY Customized for Harsh Industrial Environments with SGMII, RGZ0048B (VQFN-48)	RGZ0048B
U11	1	TPS82140SILR	17 V Input 2 A Synchronous Step-Down Converter MicroSiP Module With Integrated Inductor, SIL0008D (uSIP-8)	SIL0008D
U12, U13, U17	3	TLV62568ADRLR	1-A High Efficiency Synchronous Buck Converter with Forced PWM Feature, DRL0006A (SOT-OTHER-6)	DRL0006A
U14	1	CDCEL913IPWRQ1	Automotive Catalog Programmable 1-PLL VCXO Clock Synthesizer with 1.8-V LVCMOS Outputs, PW0014A (TSSOP-14)	PW0014A
U15, U20	2	TLV70718PDQNT	Single Output Low Noise LDO, 200 mA, Fixed 1.8 V Output, 2 to 5.5 V Input, 4-pin X2SON (DQN), -40 to 85 degC, Green (RoHS & no Sb/Br)	DQN0004A
U18, U19	2	TPS22919DCKR	5.5-V, 1.5-A, 100-mohm Load Switch with Output Discharge, DCK0006A (SOT-SC70-6)	DCK0006A
Y1	1	445I23D25M00000	Crystal, 25 MHz, 20 ppm, 18 pF, SMD	Body 5x3.2mm

5 Revision History

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

Changes from Revision * (September 2022) to Revision A (May 2023)	Page
• Deleted TI Confidential NDA banner	1
• Changed board images in *Overview* section	2
• Changed Board Layout figures	8
• Changed schematics	10
• Changed Table 4-1 in *Bill of Materials* section	15

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

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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*:

   2.1 These terms 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 a nonconforming EVM if (a) the nonconformity was 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, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, 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.

WARNING

Evaluation Kits 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 shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

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

FCC NOTICE: 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 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

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 to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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

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

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。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。 日本テキサス・インスツルメンツ株式会社

東京都新宿区西新宿 6 丁目 2 4 番 1 号

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。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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 MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS 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 EPIDEMIC FAILURE WARRANTY OR 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 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, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

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. 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 OR THE USE OF THE EVMS , 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 TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

   8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, , EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM 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.

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