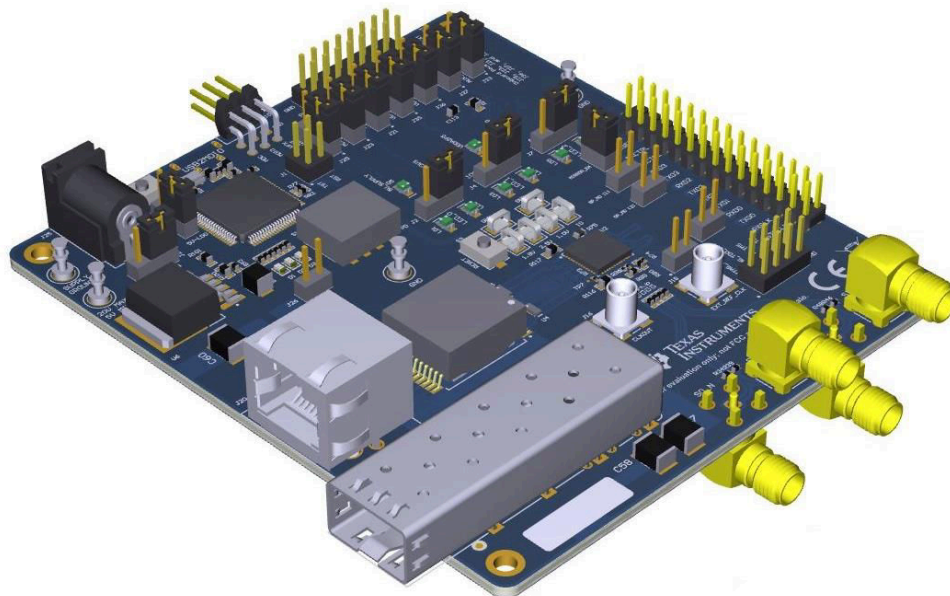


User's Guide

DP83869 Evaluation Module



ABSTRACT



This user's guide details how to properly operate and configure the DP83869EVM. For best layout practices, schematic files, and Bill of Materials, see the associated support documents.

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1 Definitions

Table 1-1. Terminology

ACRONYM	DEFINITION
PHY	Physical Layer Transceiver
MAC	Media Access Controller
SMI	Serial Management Interface
MDIO	Management Data I/O
MDC	Management Data Clock
MII	Media Independent Interface
RMII	Reduced Media Independent Interface
RGMII	Reduced Gigabit Media Independent Interface
SGMII	Serial Gigabit Media Independent Interface
VDDA	Analog Core Supply Rail
VDDIO	Digital Supply Rail
PD	Pulldown
PU	Pullup

2 Introduction

The DP83869 is a low power, fully-featured Physical Layer transceiver with integrated PMD sublayers to support 10BASE-T_e, 100BASE-TX, and 1000BASE-T Ethernet protocols. The DP83869 also supports Fiber protocols 1000BASE-X and 100BASE-FX. Optimized for ESD protection, the DP83869 exceeds 8-kV IEC 61000-4-2 (direct contact). This device interfaces to the MAC layer through Reduced GMI I (RGMII) and SGMII. Integrated Termination Impedance on RGMII helps reduce system BOM. The DP83869EVM demonstrates all features of DP83869. The EVM supports Copper Ethernet protocols, such as 10BASE-T_e, 100BASE-TX, and 1000BASE-T. The EVM also supports Fiber protocols 1000BASE-X and 100BASE-FX. The EVM has connections to use the DP83869 MAC Interface in RGMII and SGMII mode. The EVM is also optimized to demonstrate the robust EMI, EMC, and ESD performance of the DP83869 device.

2.1 Key Features

- Multiple Operating Modes
 - Media Support: Copper and Fiber
 - Media Conversion: Copper to Fiber
 - Bridge Conversion: RGMII to SGMII, SGMII to RGMII
- RGMII and SGMII MAC Interfaces
- 1000Base-X, 100Base-T, 100Base-TX, 10Base-Te
- USB-2-MDIO Support Through Onboard MSP430 for Easy Register Access
- Onboard LDO and External Power Supply Options
- Status LEDs
 - Link
 - Activity
 - Power
- Bootstraps for Hardware Configuration

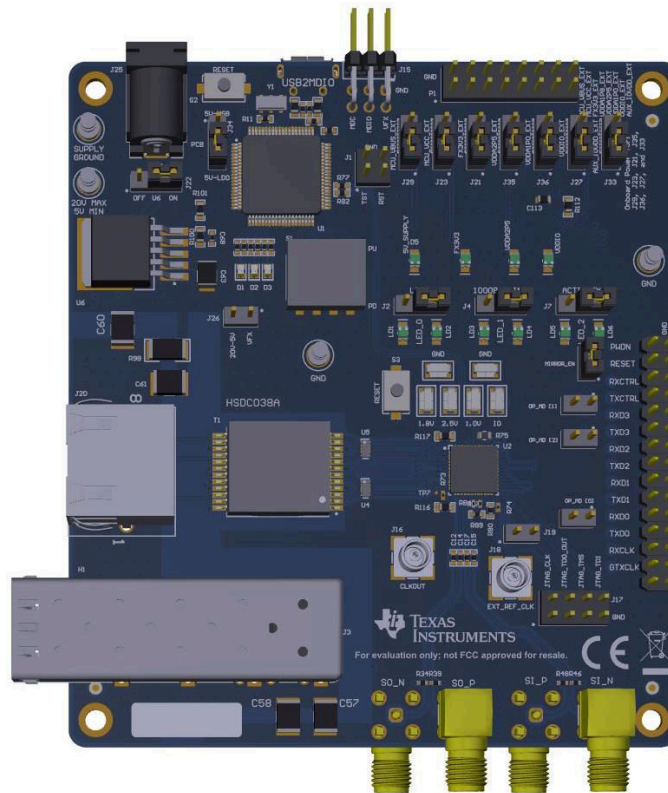


Figure 2-1. DP83869EVM – Top Side

2.2 Quick Setup

2.2.1 Onboard Power Supply Operation

The EVM can be supplied power through multiple options. Single-supply operation uses onboard LDOs to generate the voltages required for operating various sections of the EVM (PHY, MSP430, FO transceiver, and so forth).

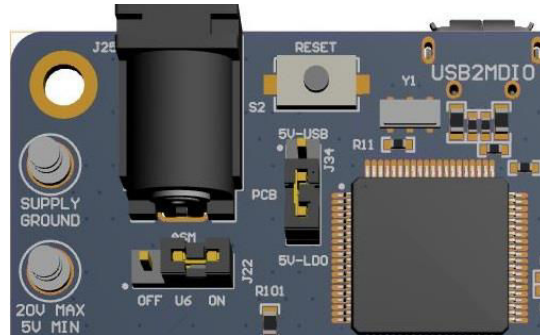


Figure 2-3. Onboard Power Supply Connection

The EVM can be supplied power by either a J25 barrel jack connector, power-supply turrets, or a USB

- For Barrel Jack and Turret, connect the jumper in the ON position to J22 and the jumper on 5V-LDO to J34.
- For USB power, connect the Jumper on 5V-USB position to J34. J22 is don't care.

2.2.2 External Power Supply Operation

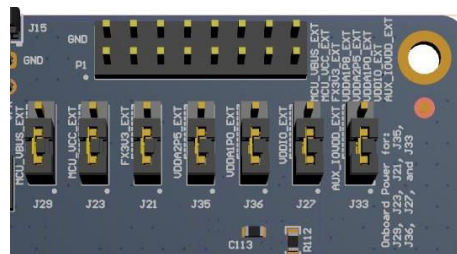


Figure 2-4. Jumper Placements for Onboard Power

The jumpers shown in [Figure 2-4](#) can be used to choose whether a particular voltage rail is supplied through onboard LDOs or an external power supply. If an external power supply is desired on a voltage rail, then change the respective jumper from position 1-2 (LDO) to 2-3 (External). Then, connect the appropriate voltage on the corresponding pin to the P1 connector. For example, if the VDDA2P5 is to be supplied from an external supply, then change jumper position of J35 from 1-2 to 2-3. Then connect the 2.5-V external supply on pins 9-10 on the P1 connector. Note that pin 9 is supply and pin 10 is ground.

2.2.3 Software

The onboard MSP430 comes pre-programmed and ready to use. When using this EVM for the first time on a Windows 7 (or above) PC, MSP430 drivers and USB2MDIO software utility has to be installed. The USB2MDIO software can be used for accessing registers.

2.2.3.1 MSP430 Driver

Install the latest MSP430 drive from this website: http://software-dl.ti.com/msp430/msp430_public_sw/mcu/msp430/MSP430_FET_Drivers/latest/index_FDS.html.

2.2.3.2 USB-2-MDIO Software

Download the software from <http://www.ti.com/tool/usb-2-mdio>. The Web page also contains a User's Guide for installing and using the software.

The MSP430 is on board the EVM, so the user does not have to purchase a separate MSP430 Launchpad kit and connect to the PHY using wires. The entire EVM can be powered and controlled through a USB connector. MSP430 and USB2MDIO utility can be used even when power is not supplied through a USB.

In case the onboard MSP430 cannot be used due to some reason, MDIO and MDC pins are also broken out on the J15 connector. Customers can connect a MSP430 launchpad or their own MDIO-MDC utility on J15 to access the PHY registers.

3 Board Setup Details

3.1 Block Diagram

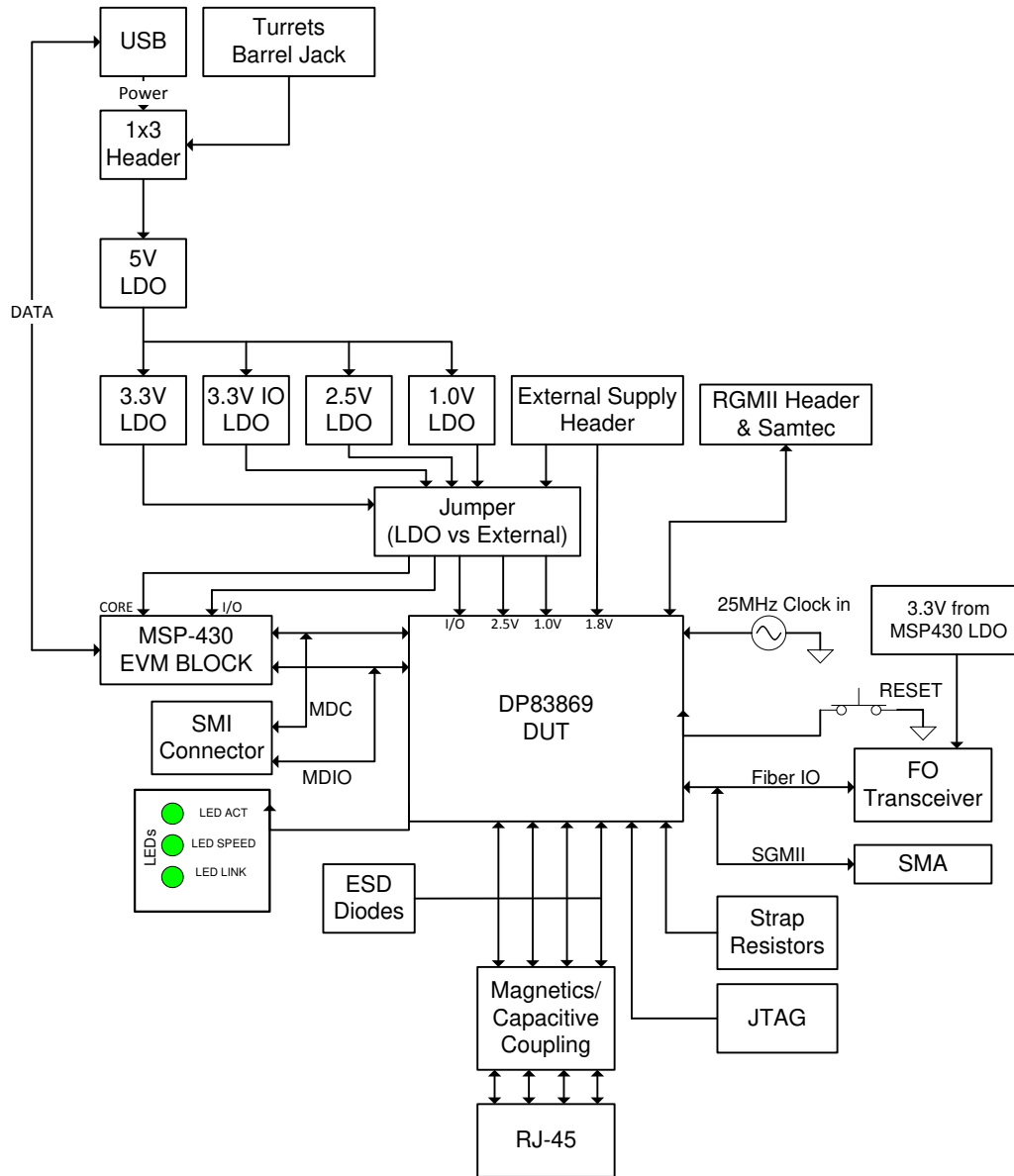


Figure 3-1. DP83869EVM Block Diagram

3.2 EVM High-Level Summary

The DP83869EVM supports SMI through J15 using pin 26 for MDIO and 28 for MDC. These pins can be connected to an MSP430 Launchpad, which can be used for USB-2-MDIO control.

Table 3-1. EVM Applications

NO.	DP83869 MODE	APPLICATIONS	HOW TO USE
1	RGMII to Copper	Run traffic between RGMII and Copper.	Connect to DP83867 RGMII EVM or MAC System using Header pins/Samtech connector.
		Perform IEEE and UNH compliance testing	Use onboard MSP430 to activate test mode waveform on DP83869.
		Run EMI/EMC Test on EVM	Use internal PRBS and loopback.
		Measure Power Dissipation	Connect external power supplies.
		External MAC loopback	Connect external MAC to headers/Samtech connector.
2	SGMII to Copper	Run traffic between SGMII and Copper.	Connect to DP83867 SGMII EVM or MAC System using SMA connector.
		Perform IEEE and UNH compliance testing	Use onboard MSP430 to activate test mode waveform on DP83869.
		Run EMI/EMC Test on EVM	Use internal PRBS and loopback.
		External SGMII loopback	Use SMA cable for Passive Loopback.
3	RGMII to Fiber Ethernet	Run traffic between RGMII and Fiber Ethernet.	Straps to enable Fiber Ethernet. Connect to DP83867 RGMII EVM or MAC System using Header/Samtech.
		Perform IEEE and UNH compliance testing	Use onboard MSP430 to activate test mode waveforms.
		Run EMI/EMC Test on EVM	Use internal PRBS and loopback.
		Measure Power Dissipation	Connect external power supplies.
4	100 M Media Convertor	Demonstrate 100 M functionality on EVM	Use SFP and RJ45 connector for fiber and copper ethernet. Straps are used for unmanaged mode and MDIO for managed mode.
		Demonstrate FAR End fault capability	
		Demonstrate unmanaged mode of Media convertor	
5	1000 M Media Convertor	Demonstrate 1000 M functionality on EVM	Use SFP and RJ45 connector for fiber and copper ethernet. Straps are used for unmanaged mode and MDIO for managed mode.
		Demonstrate Link Loss Pass Thru Capability	
		Demonstrate unmanaged mode of Media Convertor	
6	RGMII to SGMII bridge	Demonstrate SGMII as MAC able to link with SGMII i/f of Phy (DP83867)	Connect to DP83867 SGMII EVM over SMA connectors and monitor RGMII header on 869 EVM.
		Demonstrate SGMII link speed is reflected on RGMII	
		Demonstrate Complete Data path Use-case	Use DP83867 RGMII EVM and SGMII EVM with DP83869EVM.
7	SGMII to RGMII bridge	Demonstrate RGMII of DP83869 is able to link-up with RGMII of DP83867	Connect to DP83867 RGMII EVM over Samtech connectors and monitor SGMII SMA on 869 EVM.
		Demonstrate SGMII link speed is reflecting RGMII speed	
		Demonstrate Complete Data path Use-case	Use DP83867 RGMII EVM and SGMII EVM with DP83869EVM.

4 Configuration Options

4.1 Bootstrap Options

All straps are only two-level straps in DP83869 except PHYADD straps. EVM support one pullup and one pulldown resistor pad on RX_D0 and RX_D2 for PHY address straps. There is only one pullup resistor on all other strap pins with a jumper option to disconnect.

Table 4-1. 4 Level Straps

STRAP VALUE	MODE 0	MODE 1	MODE 2	MODE 3
Resistor PU (kΩ)	Open	10	5.76	2.49
Resistor PD (kΩ)	Open	2.49	2.49	Open

Table 4-2. 2 Level Straps

STRAP VALUE	MODE 0	MODE 1
Resistor PU (kΩ)	Open	2.49
Resistor PD (kΩ)	2.49	Open

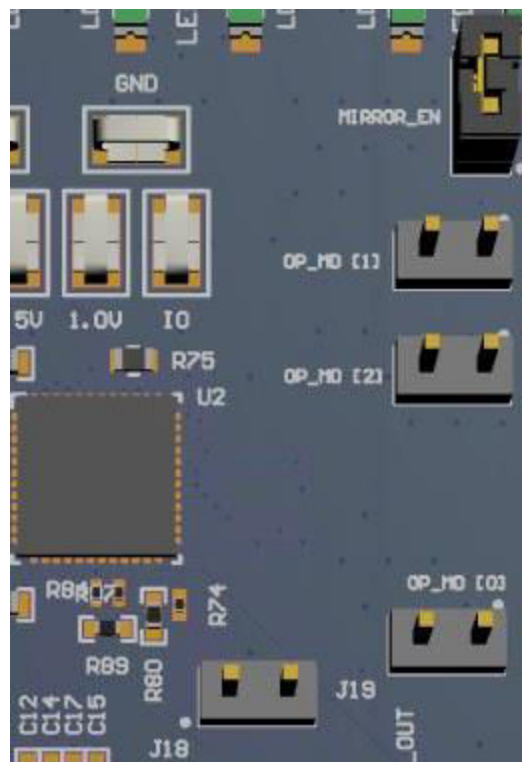


Figure 4-1. EVM Strap Jumpers

4.1.1 Straps for PHY Address

Table 4-3. PHY Strap Table

PIN NAME	STRAP NAME	PIN NO.	DEFAULT		
RX_D0	PHY_ADD[1:0]	33	00	PHY_ADD1	
				PHY_ADD0	
				MODE 0	0 0
				MODE 1	0 1
RX_D1	PHY_ADD[3:2]	34	00	PHY_ADD3	
				PHY_ADD2	
				MODE 0	0 0
				MODE 1	0 1
				MODE 2	1 0
				MODE 3	1 1

4.1.2 Strap for DP83869 Functional Mode Selection

Table 4-4. Functional Mode Strap Table

PIN NAME	STRAP NAME	PIN NO.	DEFAULT	OPMO DE_2	OPMO DE_1	OPMO DE_0	FUNCTIONAL MODES
JTAG_TDO/ GPIO_1	OPMODE_0	22	0	0	0	0	RGMII to Copper(1000Base-T/ 100Base-TX/10Base-Te)
				0	0	1	RGMII to 1000Base-X
RX_D3	OPMODE_1	36	0	0	1	0	RGMII to 100Base-FX
				0	1	1	RGMII-SGMII Bridge Mode
RX_D2	OPMODE_2	35	0	1	0	0	1000Base-T to 1000Base-X
				1	0	1	100Base-T to 100Base-FX
				1	1	0	SGMII to Copper(1000Base-T/ 100Base-TX/10Base-Te)
				1	1	1	JTAG for boundary scan

4.1.3 Straps for RGMII/SGMII to Copper

Table 4-5. Copper Ethernet Strap Table

PIN NAME	STRAP NAME	PIN NO.	DEFAULT	ANEG_DIS	ANEGS EL_1	ANEGS EL_0	FUNCTION
LED_0	ANEG_DIS	47	0	0	0	0	Auto-negotiation, 1000/100/10 advertised, Auto MDI-X
				0	0	1	Auto-negotiation, 1000/100 advertised, Auto MDI-X
LED_1	ANEGSEL_0	46	0	0	1	0	Auto-negotiation, 100/10 advertised, Auto-MDI-X
				0	1	1	Reserved (JTAG for boundary scan)
				1	0	0	Forced 1000 M, master, MDI mode
LED_2	ANEGSEL_1	45	0	1	0	1	Forced 1000 M, slave, MDI mode
				1	1	0	Forced 100 M, full duplex, MDI mode
RX_CTRL	MIRROR_EN	38	0				Port Mirroring Disabled
							Port Mirroring Enabled

4.1.4 Straps for RGMII to 1000Base-X

Table 4-6. 1000Base-X Strap Table

PIN NAME	STRAP NAME	PIN #	DEFAULT		
LED_0	ANEG_DIS	47	0	0	Fiber Auto-negotiation ON
				1	Fiber Force mode
LED_1	ANEGSEL_0	46	0	0	Signal Detect disable on Pin 24
				1	Configure Pin 24 as Signal Detect Pin

4.1.5 Straps for RGMII to 100Base-FX

Table 4-7. 100Base-X Strap Table

PIN NAME	STRAP NAME	PIN #	DEFAULT		
LED_1	ANEGSEL_0	46	0	0	Signal Detect disable on Pin 24
				1	Configure Pin 24 as Signal Detect Pin

4.1.6 Straps for Bridge Mode (SGMII-RGMII)

Table 4-8. Bridge Mode Strap Table

PIN NAME	STRAP NAME	PIN #	DEFAULT		
RX_CTRL	MIRROR_EN	38	0	0	RGMII to SGMII (RGMII : MAC I/F, SGMII : Phy I/F)
				1	SGMII to RGMII (SGMII : MAC I/F, RGMII : Phy I/F)

4.1.7 Straps for 100 M Media Converter

Table 4-9. 100 M Media Converter Strap Table

PIN NAME	STRAP NAME	PIN #	DEFAULT			
LED_1	ANEGSEL_0	46	0	ANEGSEL_1	ANEGSEL_0	
LED_2	ANEGSEL_1	45	0	0	0	Copper : Auto-negotiation (100/10 Advertised), Auto MDIX
				1	1	Copper : Auto Negotiation (100 Advertised), Auto MDIX
RX_CTRL	MIRROR_EN	38	0	0	Copper: Mirror Disable	
				1	Copper: Mirror Enable	
RX_CLK	LINK_LOSS	32	0	0	Link Loss Pass Thru Enabled	
				1	Link Loss Pass Thru Disabled	

4.1.8 Straps for 1000 M Media Converter

Table 4-10. 1000 M Media Strap Table

PIN NAME	STRAP NAME	PIN #	DEFAULT			
LED_0	ANEG_DIS	47	0	0	Fiber Auto Negotiation	
				1	Fiber Force Mode	
LED_1	ANEGSEL_0	46	0	ANEGSEL_1	ANEGSEL_0	
LED_2	ANEGSEL_1	45	0	0	0	Copper : Auto-negotiation (1000/100 Advertised), Auto MDIX
				1	1	Copper : Auto Negotiation (1000 Advertised), Auto MDIX

4.2 SGMII/Fiber Interface

SGMII Pins from the DUT are multipurpose pins functioning as SGMII and Fiber IO pins. By default, the EVM is configured for Fiber operation.

Note

Fiber Transceiver is not a part of the EVM package. SFP cage and SFP connector need to be mounted.

For routing signals to Fiber Transceiver, populate R31, R38, R45, and R47. Remove C12, C14, C15, and C17.

For routing signals to SGMII SMAs, populate C12, C14, C15, and C17. Remove R31, R38, R45, and R47.

4.3 RGMII

RGMII signals are routed to standard 2.54-mm header connectors on J14. RGMII can be used both in Copper mode and Fiber mode.

4.4 Clock Output

The EVM has a SMB connector to output clock from the PHY. A 50-Ω Coax cable with a SMB connector needs to be used for accessing the clock output.

4.5 Clock Input

The EVM is configured for default crystal input clock operation. The EVM supports the option to provide clock from 25-MHz crystal, 25-MHz CMOS oscillator, and the External clock from the SMB connector. A 50-Ω Coax cable with a SMB connector needs to be used for providing clock input from external sources.

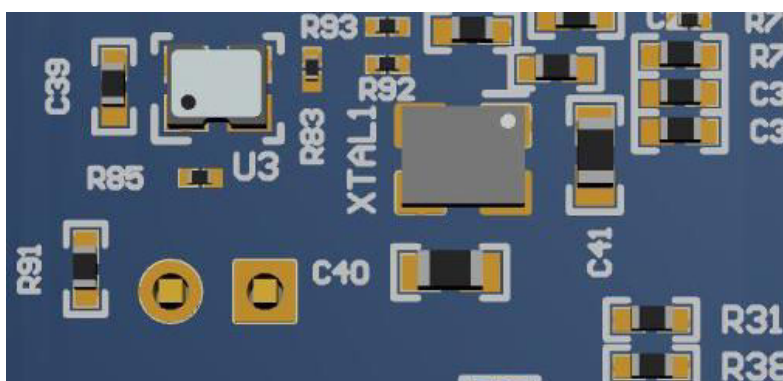


Figure 4-2. Onboard Clock



Figure 4-3. External Clock Input

4.6 Switch Configuration Options

The DP83869EVM includes a 4-pin dip switch (S1), which can be used for various test modes and feature displays. Some of the switch settings can also be used with the USB-2-MDIO GUI for additional control. Except for switch mode 15, all switch modes are hard-coded and can be used without USB-2-MDIO or any other serial com port. Refer to [Table 4-11](#) for switch configurations and LED outputs. For each switch, PU is 1 and PD is 0.

Table 4-11. 4-Pin Dip Switch Modes

Mode	SW[4:1]	Feature	LED Description	LED D14	LED D15	LED D16	USB2MDIO
0	0000	Normal Operation	USB-2-MDIO Active (Flashes very briefly red during read and green during write)	Red Green	Off	Off	Yes
			Program failed to read PHY register	Red	Off	Off	No
			Program failed to write PHY register	Green	Off	Off	
1	0001	Test Mode 1 - Droop	Successfully entered Test Mode 1	Red Green	Off	Green	Yes
			Failed to enter Test Mode 1 (Flashing LEDs)	Red	Red	Red	No
2	0010	Test Mode 2 - Clock Frequency, Master Jitter	Successfully entered Test Mode 2	Red Green	Off	Red	Yes
			Failed to enter Test Mode 2 (Flashing LEDs)	Red	Red	Red	No
3	0011	Test Mode 3 - Slave Jitter	Successfully entered Test Mode 3	Red Green	Off	Red Green	Yes
			Failed to enter Test Mode 3 (Flashing LEDs)	Red	Red	Red	No
4	0100	Test Mode 4 - Distortion	Successfully entered Test Mode 4	Red Green	Green	Off	Yes
			Failed to enter Test Mode 4 (Flashing LEDs)	Red	Red	Red	No
5	0101	Test Mode 5	Successfully entered Test Mode 5	Red Green	Green	Green	Yes
			Failed to set Test Mode 5 (Flashing LEDs)	Red	Red	Red	No
6	0110	Force 100Mbps	Force 100-Mbps speed with force MDI	Red Green	Green	Red	Yes
			Program failed to program the PHY registers	Off	Green	Red	No
7	0111	Force 10Mbps	Force 10-Mbps speed with force MDI and PRBS on.	Off	Green	Red	No
			Program failed to program the PHY registers	Red	Red	Red	
8	1000	Reverse Loopback	Successfully entered Reverse Loopback	Red Green	Red	Off	Yes
			Failed to enter Reverse Loopback (Flashing LEDs)	Red	Red	Red	No
9	1001	xMII Loopback	Successfully entered xMII Loopback	Red Green	Red	Green	Yes
			Failed to enter xMII Loopback (Flashing LEDs)	Red	Red	Red	No
10	1010	Enable BIST	Enable BIST in Copper Ethernet Mode	Red	Green	Red Green	No
			Program failed to program the PHY registers	Red	Red	Red	
11 - 14	1011 - 1110	RESERVED	RESERVED	-	-	-	No

Table 4-11. 4-Pin Dip Switch Modes (continued)

Mode	SW[4:1]	Feature	LED Description	LED D14	LED D15	LED D16	USB2MDIO
15	1111	LOOP: Read data continuously from a list of registers loaded to the MC	To upload a list of registers to continuously read from with USB-2-MDIO: Write the hex value of the register you want to add to the list to the register address "LOAD"	Red Green	Red Green	Red Green	Yes ⁽¹⁾
			To begin reading data continuously with USB-2-MDIO: Read the register address "OPEN"				
			To stop reading data continuously with USB-2-MDIO: Read the register address "STOP"				

(1) During the loop for Mode 15, USB-2-MDIO is not operational. However, other serial port terminals (that is, PuTTY) can be used to view real-time data.

When running switch mode 15, data is constantly sent to the serial port. USB-2-MDIO is not capable of supporting the constant read feature. However, other serial port terminals, that is, PuTTY, can be used. When using a serial port terminal, copy and paste data. Do not enter in the data slowly, because the firmware executes as soon as the data is received.

To load a list of registers to read data from, follow this data format:

##LOADAAAAB/

- ## = Two digit PHY ID expressed in decimal form
- LOAD = the string 'LOAD' indicates to the MC to add a register to the list
- AAAA = Four character Register Address to read data from in hex form (that is, Read register 0x133h, set AAAA = 0133)
- B = use '*' for an extended access read and '=' for a direct access read
- / = end string with '/'

For example, to load register 0x462h with PHY_ID = 1 with extended access, copy and paste the following command into a serial com terminal: 01LOAD0462*/

To start reading data, continuously copy and paste the following into the serial com terminal: OPEN

To stop reading data, continuously copy and paste the following into the serial com terminal: STOP

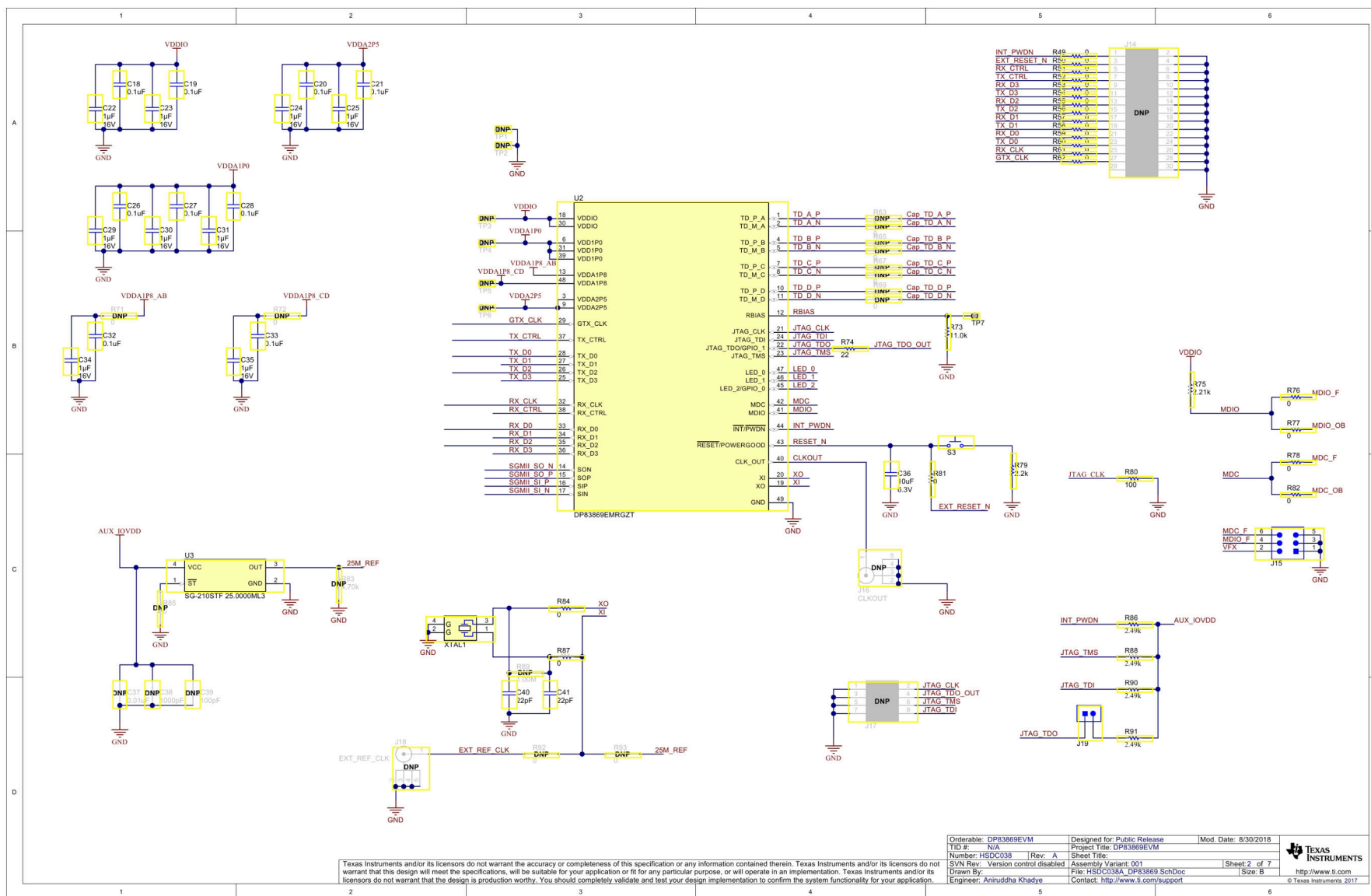
Note

The *OPEN* and *STOP* commands are in no particular position, so the designer can copy *OPENSTOP* and paste into the serial com terminal once to start reading data and then paste again to stop reading data, for example.

Note

When the read loop is stopped, the list of registers to read is cleared.

5 Schematics



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Orderable: DP83869EVM	Designed for: Public Release	Mod Date: 8/30/2018	
TID #: N/A	Project Title: DP83869EVM	Sheet Title:	
Number: HSDC038	Rev: A	Assembly Variant: 001	
SVN Rev: Version control disabled	File: HSDC038A_DP83869 SchDoc	Size: B	
Drawn By: Engineer: Anirudha Khadiye	Contact: http://www.ti.com/support	Sheet 2 of 7	

Figure 5-1. Schematic Page 1

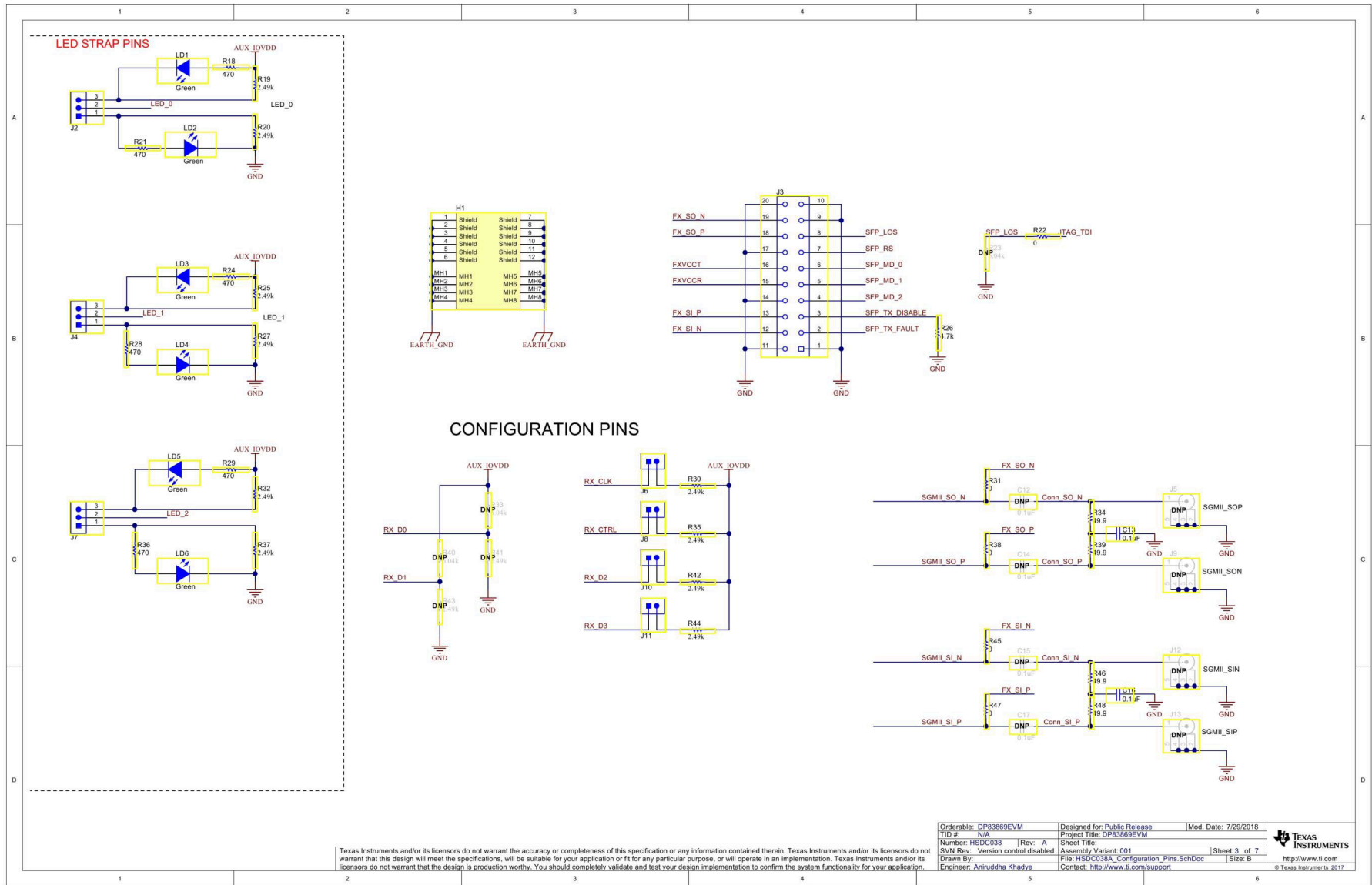
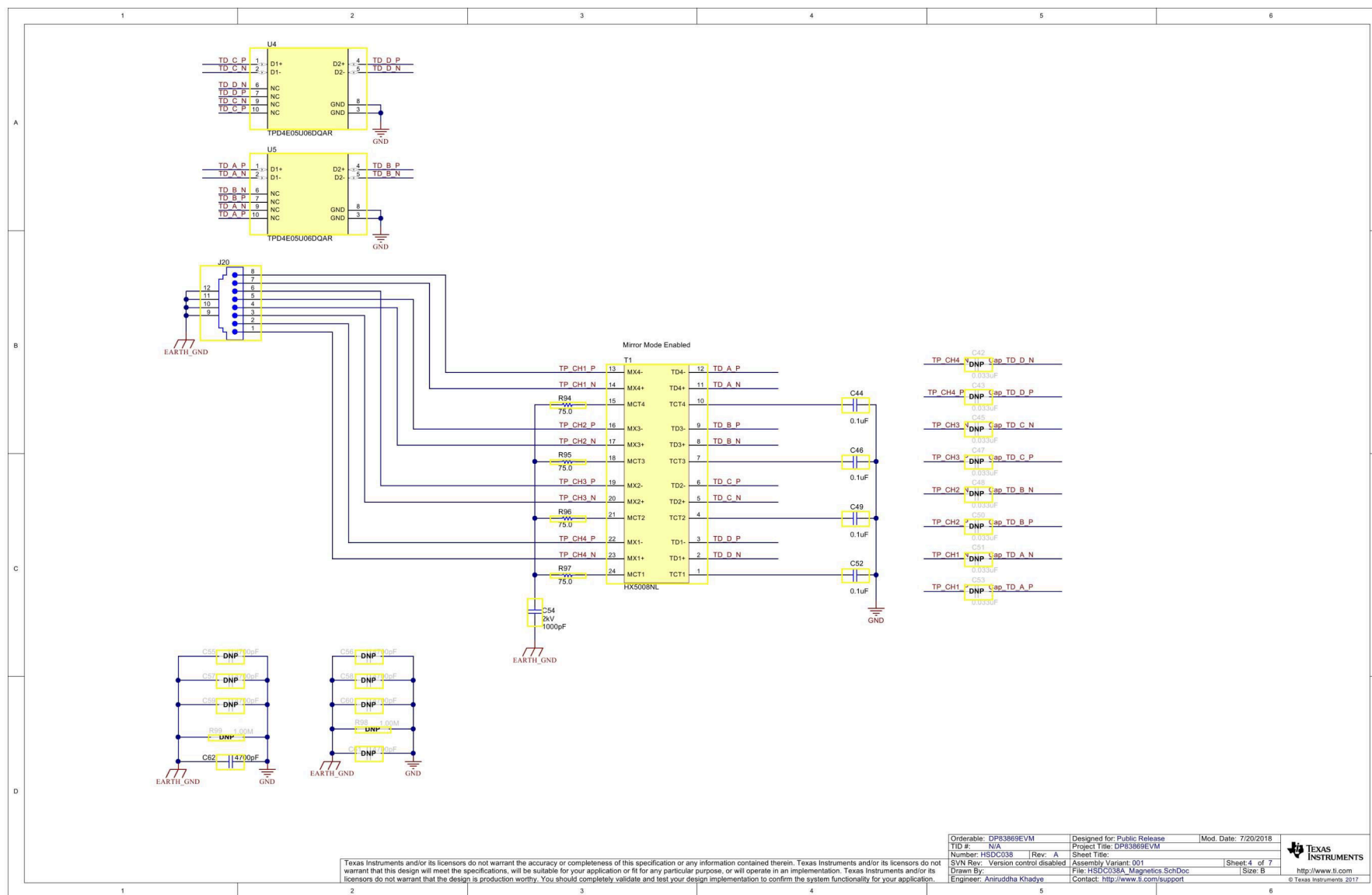


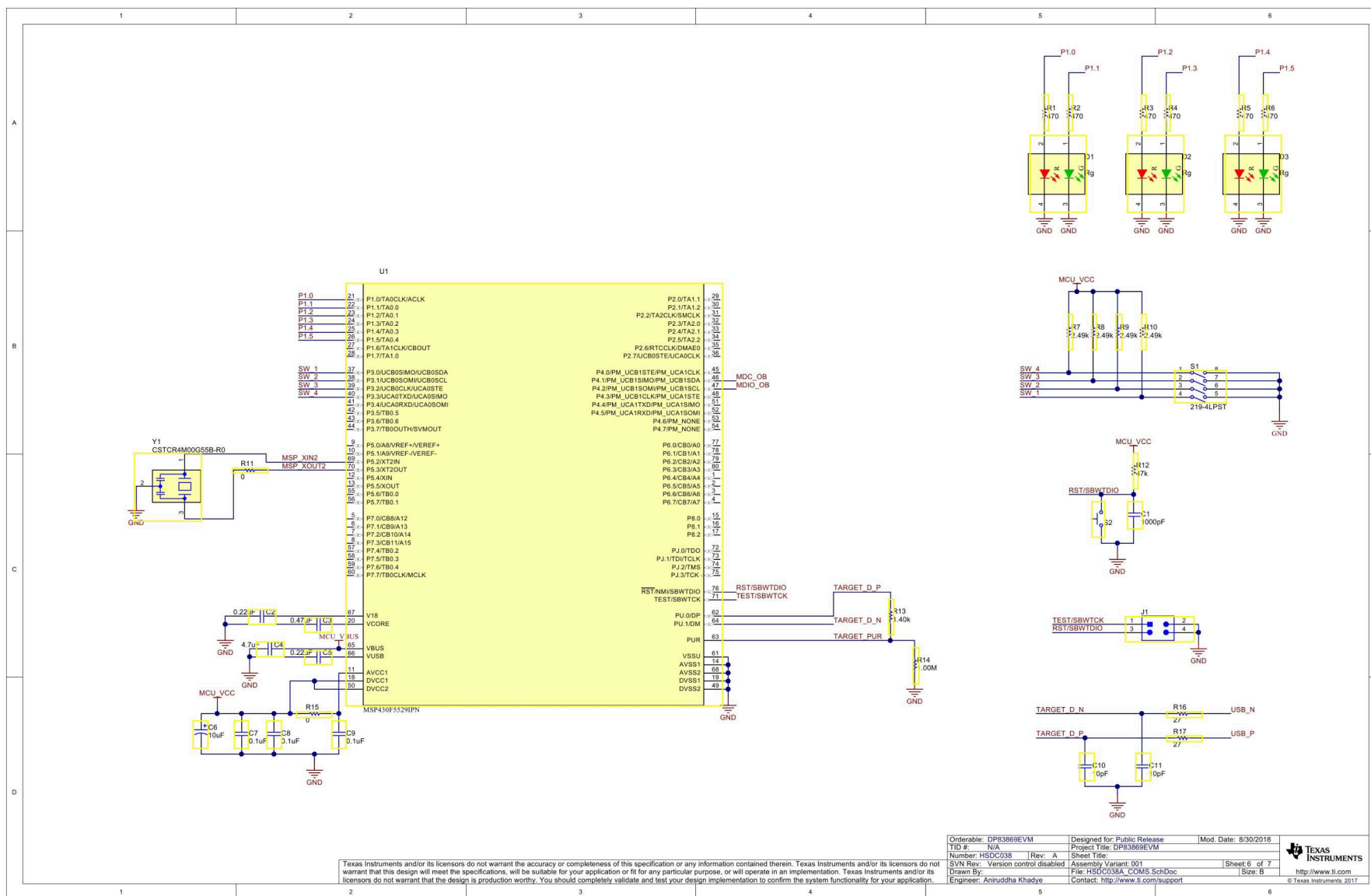
Figure 5-2. Schematic Page 2



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TID #: N/A	Project Title: DP83869EVMM	Sheet Title:	
Number: HSDC038	Rev: A	Assembly Variant: 001	
SVN Rev: Version control disabled	File: HSDC038A_Magnetics_SchDoc	Size: B	
Drawn By: Anirudha Khadiye	Contact: http://www.ti.com/support	Sheet 4 of 7	

Figure 5-3. Schematic Page 3



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Number: HSDC038	Rev: A	Sheet Title:	
S/N Rev: Version control disabled	Assembly Variant: 001	Sheet 6 of 7	
Drawn By:	File: HSDC038A_COMS_SchDoc	Size: B	
Engineer: Anirudha Khadiye	Contact: http://www.ti.com/support		

Figure 5-5. Schematic Page 5

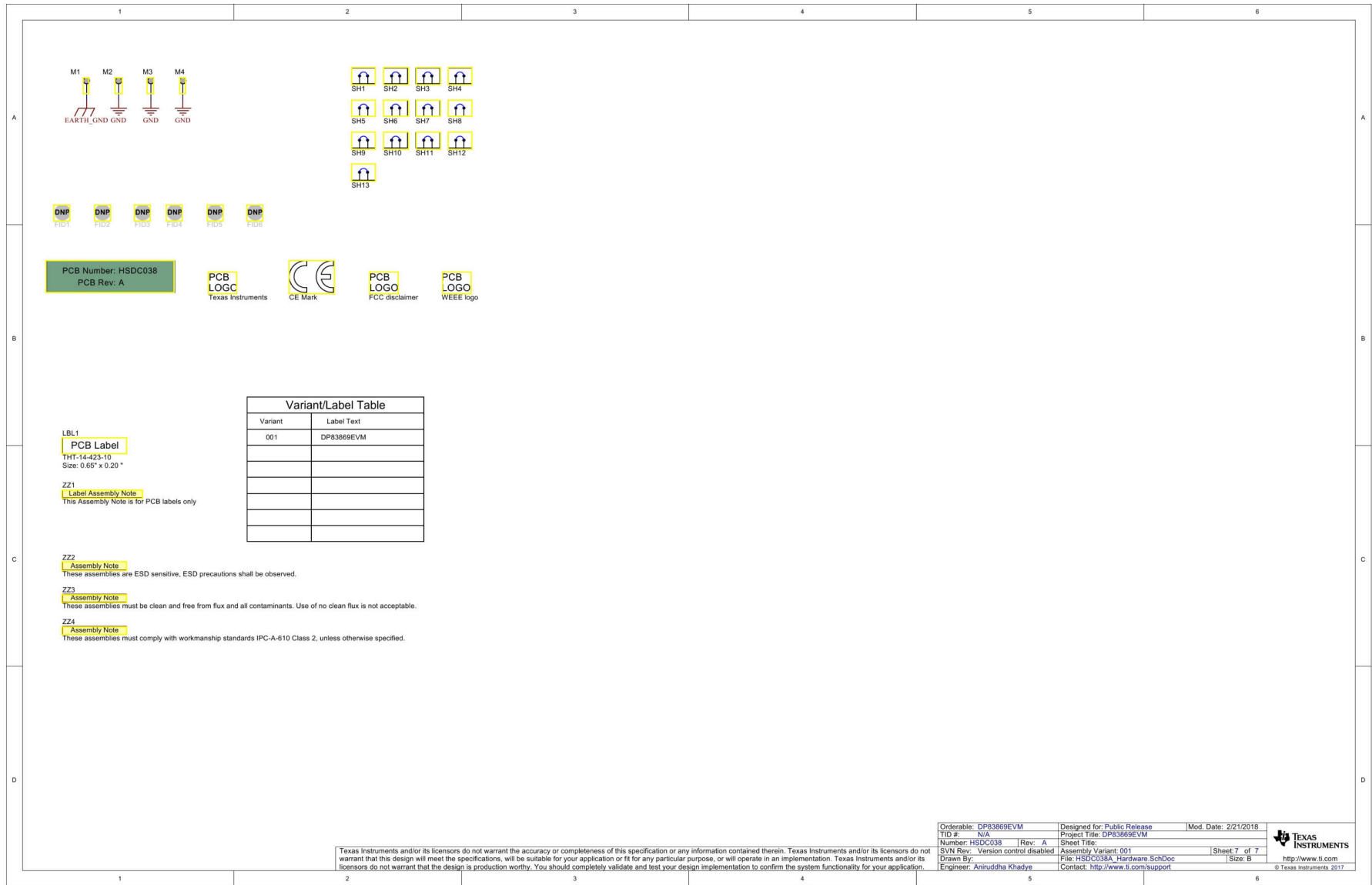


Figure 5-6. Schematic Page 6

6 Revision History

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

Changes from Revision * (April 2018) to Revision A (January 2024)	Page
• Changed jumper number from <i>J26</i> to <i>J25</i> and jumper number <i>J35</i> to <i>J34</i>	6
• Changed jumper number from <i>J36</i> to <i>J35</i>	6
• Updated note in <i>SGMII/Fiber Interface</i> section.....	13
• Changed switch from <i>S3</i> to <i>S1</i>	14

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.
 - 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 semiconductor 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 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 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 DEGRADATION 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/llds/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。

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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/llds/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.

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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 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:*

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8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY 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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