User's Guide

DP83TC813EVM-MC User's Guide

ABSTRACT

This User's Guide discusses how to properly operate and configure the DP83TC813 Media Converter EVM. For best layout practices, schematic files, and Bill of Materials, see the associated support documents.

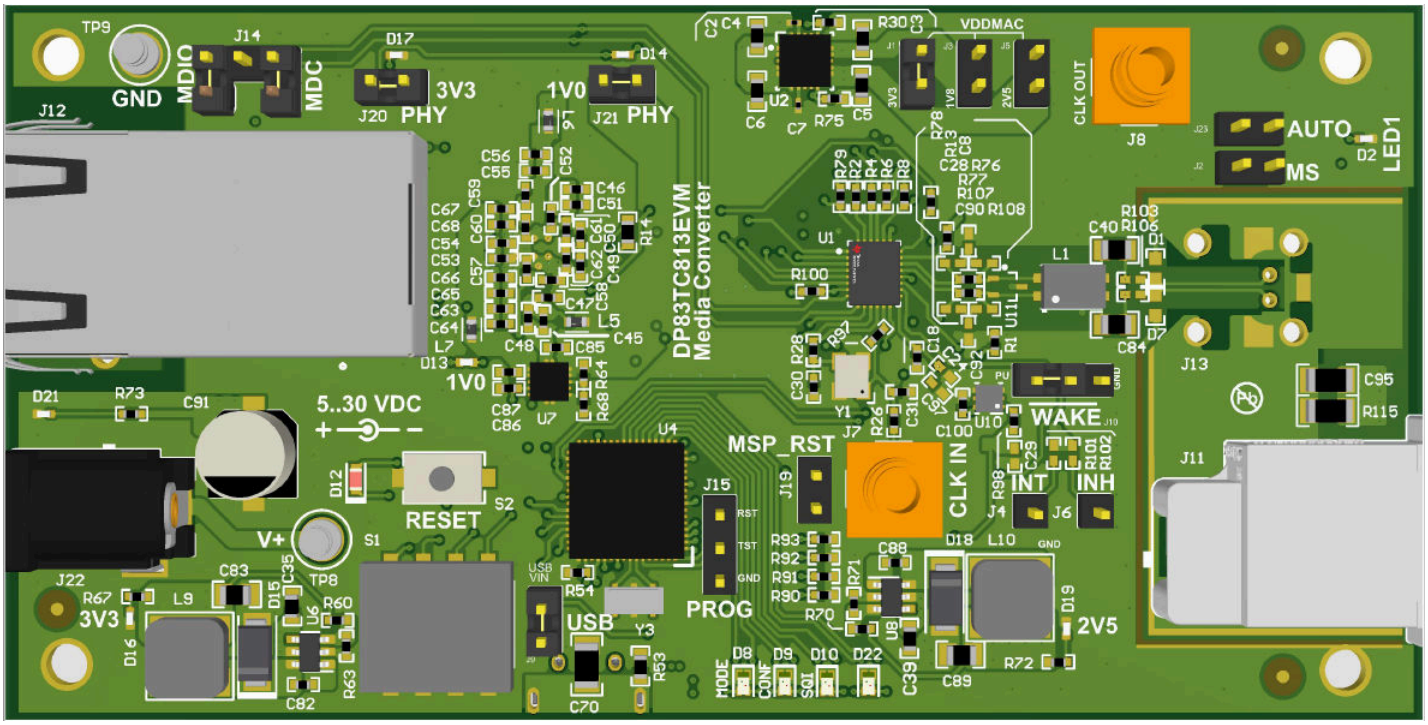

Figure 1-1. DP83TC813EVM-MC

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1 Revision History

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

DATE	REVISION	NOTES
May 2022	*	Initial Release

Trademarks

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2 Introduction

The DP83TC813EVM-MC supports 100-Mbps speed and is IEEE 802.3bw compliant. There is an onboard MSP430F5528 for use with the USB2MDIO graphical user interface tool. The DP83867 is provided for copper (100BASE-TX) support using a RGMII MAC Interface.

2.1 Key Features

- Media Converter: 100BASE-T1 to 100BASE-TX
- IEEE802.3bw Compliant
- IEEE802.3u Compliant
- RGMII Back-to-Back Configuration
- Onboard MSP430F5528
  - USB-2-MDIO Support
- Status LEDs
  - DP83TC813
    - Link
    - Link + Activity
  - DP83867
    - Link (RJ-45)
  - Power-on Indicator (D21, D16, D17, D14, D19, D13)
- Variable VDDMAC Voltage Range: 1.8 V, 2.5 V, and 3.3 V

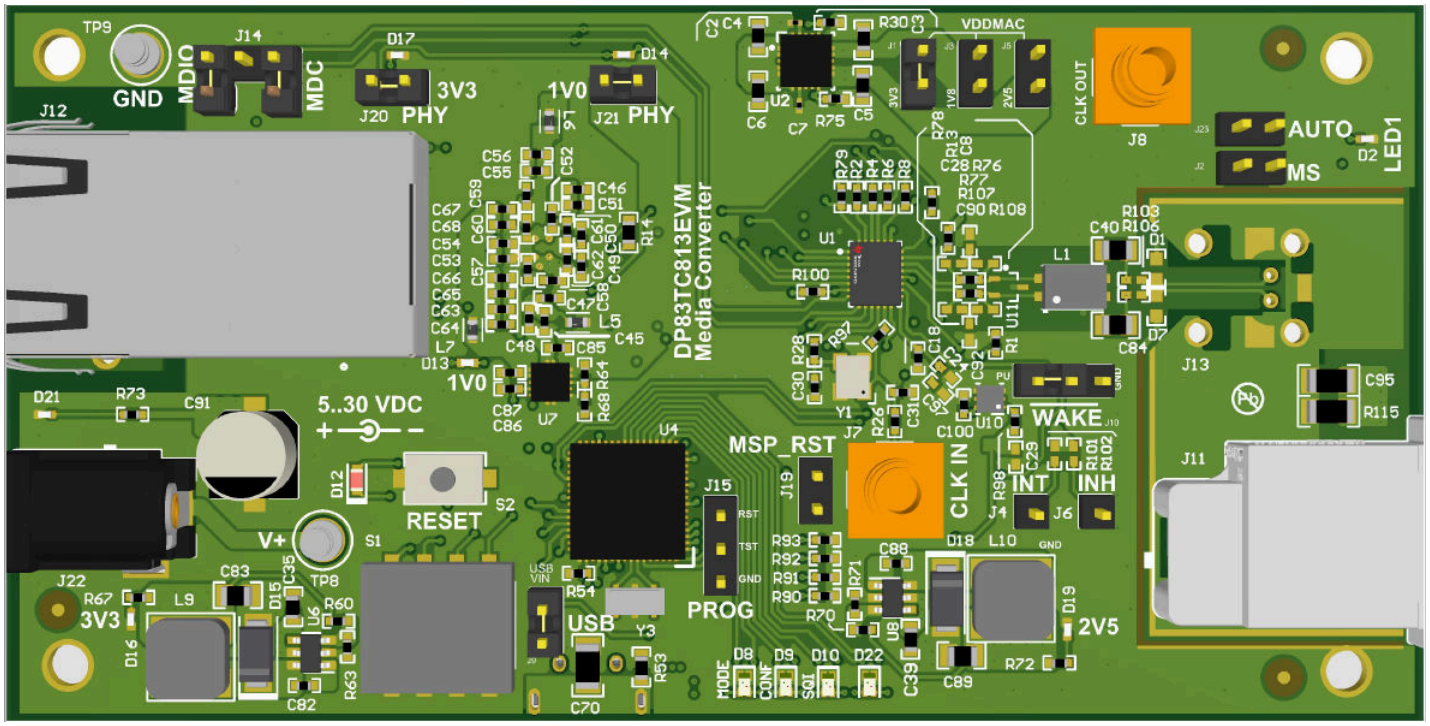


Figure 2-1. DP83TC813EVM-MC – Top Side

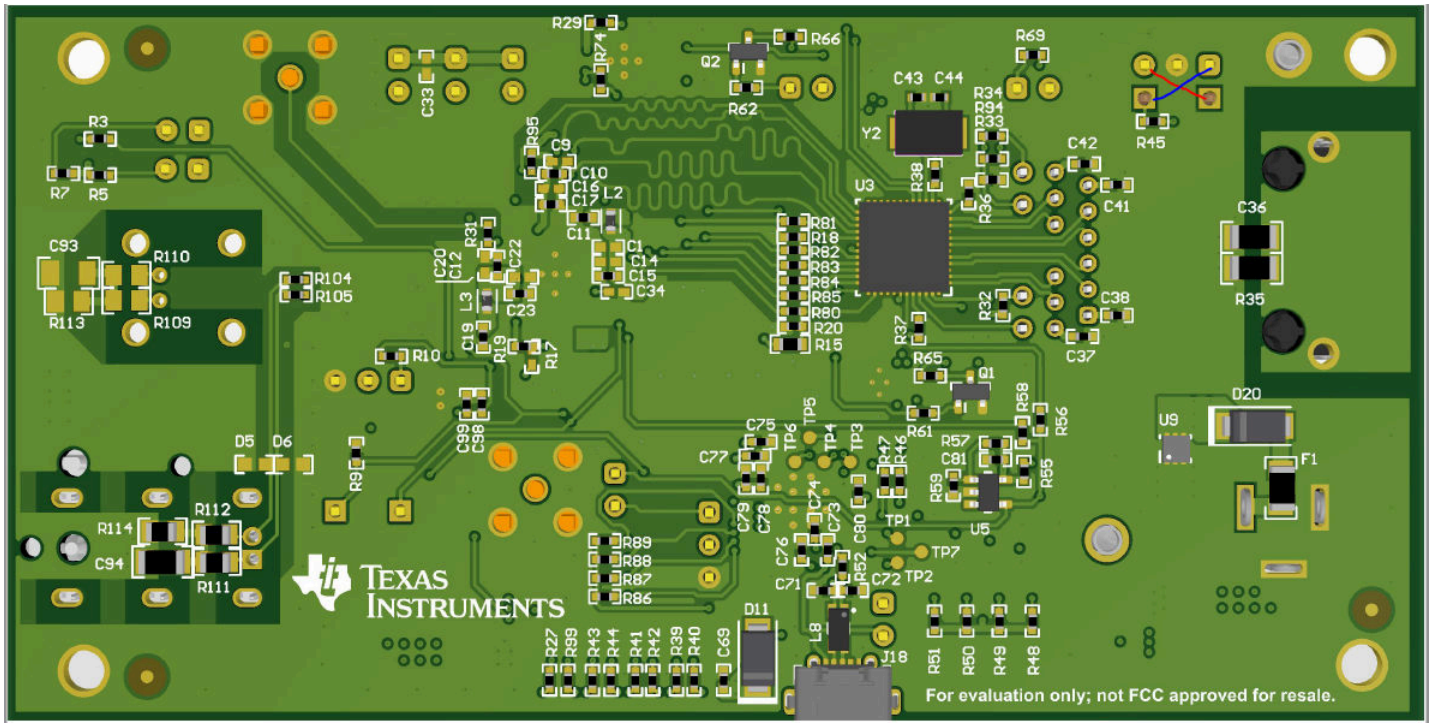


Figure 2-2. DP83TC813EVM-MC – Bottom Side

2.2 Operation – Quick Setup

2.2.1 Onboard Power Supply Operation

- The EVM can operate from a single supply connected to the turret (TP8: VIN, TP9: GND) or barrel jack connector (J22).
  - Wide Vin: 5 V to 30 V
- Place shunts on J20, and J21 to enable onboard LDOs for VDD3P3, and VDD1P0
- Place shunt on VDDMAC. This supply can have adjustable voltages depending on location of shunt.
  - J1 for 3.3V operation
  - J3 for 1.8V operation
  - J5 for 2.5V operation
- Place shunts on J10 (left and center) to keep WAKE pin high

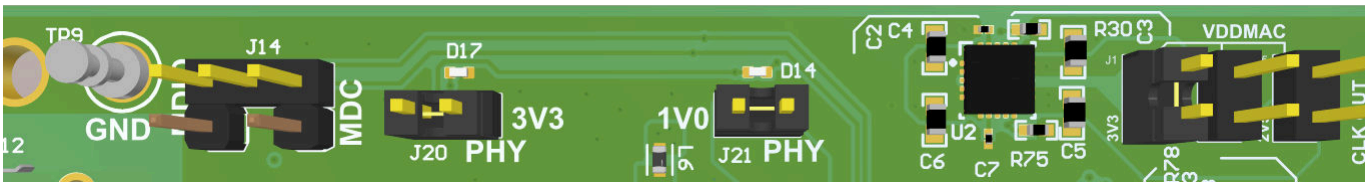


Figure 2-3. Onboard Supply Connection and Jumpers

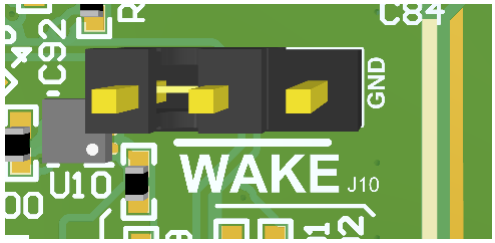


Figure 2-4. WAKE Jumper

Note

- The board can also be powered over USB by populating J9 and connecting the USB cable to a 5V source such as a laptop. Ensure the external supply is not connected to turrets or barrel jack when using the USB power. This header has a 5-V maximum limit.

2.2.2 SMI Connection and Communication

2.2.2.1 Onboard MSP Connection

- There is no additional action needed for using the onboard MSP430 device for MDC/MDIO configuration. Connections are done at bottom of the board and hence no jumpers should be placed on J14.

Note

- To use external MSP connection, please connect MDC of MSP to top-right most pin of J14 and MDIO to top-left most pin of J14.

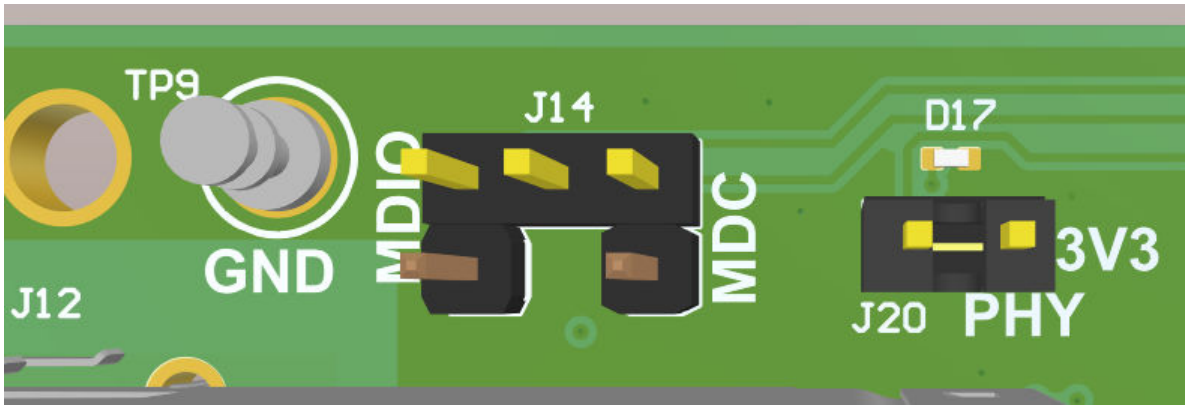


Figure 2-5. Onboard MSP Connections for MDIO and MDC

2.2.2.2 Downloading USB2MDIO for SMI

The onboard MSP430 comes pre-programmed and ready to use. When using this EVM for the first time on a Windows 10 PC, MSP430 drivers and USB-2-MDIO software utility need to be installed. USB-2-MDIO software can be used for accessing the PHY's registers. The software is available to download along with its user's guide in the link. USB2MDIO

2.2.2.3 SMI Interface

Note

- DP83TC813 PHY_ID on EVM is 10
- DP83867 PHY_ID on EVM is 01

After installing and enabling the USB2MDIO tool, power on the EVM and connect to the computer through the micro-USB port. Verify communication on each PHY by reading register 0x0001.

- DP83TC813 will read 0x1 = 0x0061 with no link partner and 0x1 = 0x0065 with a link partner connected
- DP83867 will read 0x1 = 0x7949 with no link partner and 0x1 = 0x796D with a link partner connected
- To enable analog loopback on the DP83TC813, write 0x0108 to address 0x0016

2.2.3 Master and Slave Mode Selection – DP83TC813

- Master Mode
  - Place shunt across J2
- Slave Mode
  - Leave J2 open

- Power cycle the board or reset the PHY (via reset button) after changing strap jumpers for them to become effective

2.2.4 Autonomous/Managed Selection – DP83TC813

- Autonomous Mode
  - Leave J23 open
- Managed Mode
  - Place shunt on J23
- Power cycle the board or reset the PHY (via reset button) after changing strap jumpers for them to become effective

Figure 2-6 shows jumper in PU position on header.

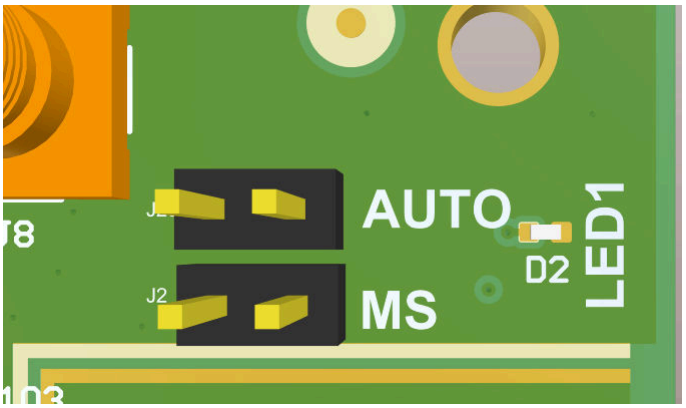


Figure 2-6. DP83TC813 Configured in Autonomous and Slave Modes

2.2.5 LED Indication

- Look for LED to illuminate on the RJ45 when a link is successfully established on the DP83867
- LED_1 (D2) will turn only if R17 is populated (DNP by default). This pin is CLKOUT by default and would need to be programmed accordingly.

3 Board Setup Details

3.1 Block Diagram

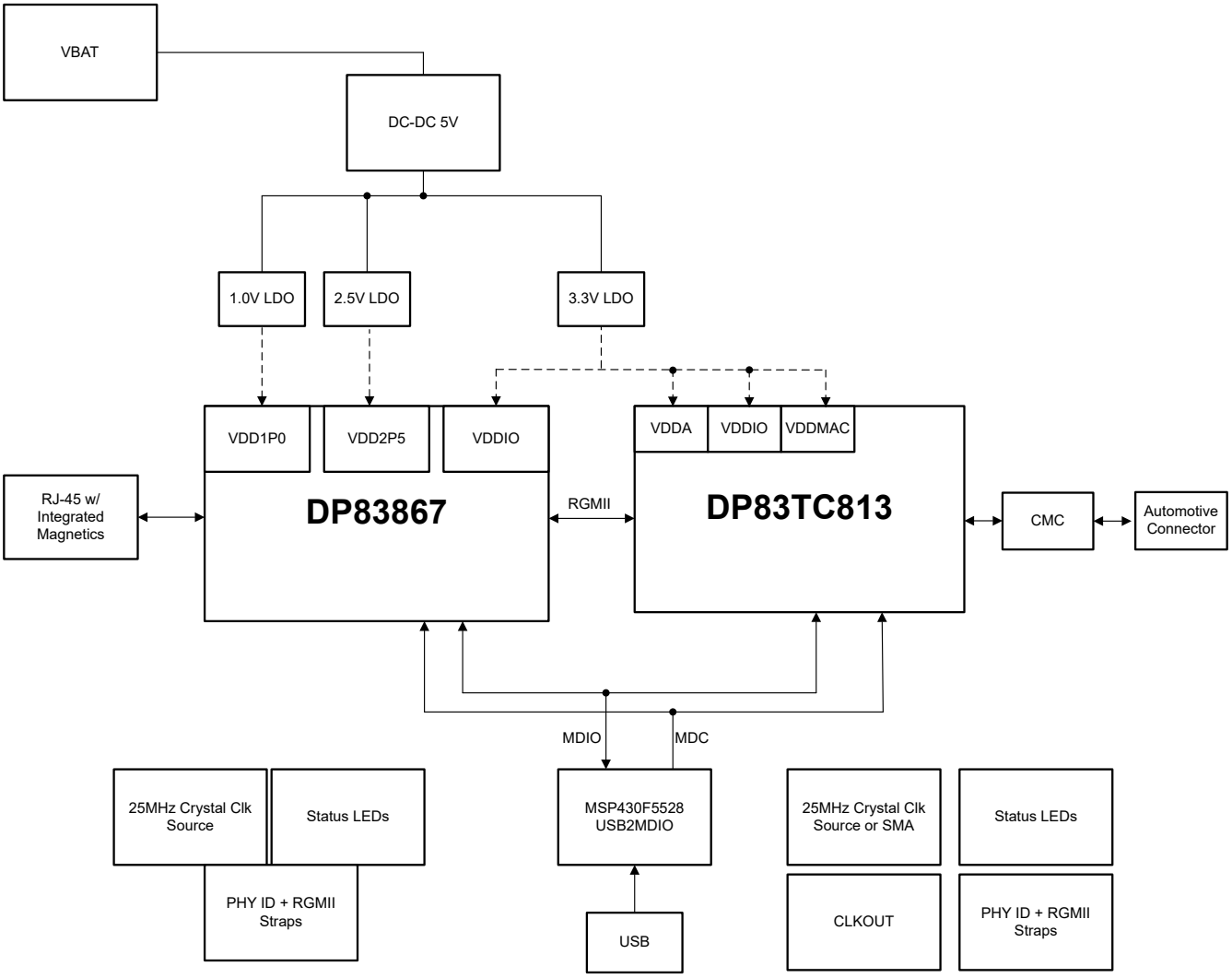


Figure 3-1. DP83TC813EVM-MC Block Diagram

3.2 Configuration Options

3.2.1 Clock Configuration

- Onboard clock
  - The onboard crystal is enabled by default
- To provide external clock
  - Remove R28 and Y1
  - Populate R26 with a 0-Ω resistor
  - Use the SMA labeled CLK_IN to input the external clock source

4 Definitions

Terminology

PHY	Physical Layer Transceiver
MAC	Media Access Controller
SMI	Serial Management Interface
MDIO	Management Data I/O
MDC	Management Data Clock
RGMII	Reduced Gigabyte Media Independent Interface
SFD	Start-of-Frame Detection
VDDA	Analog Core Supply Rail
VDDIO	Digital Supply Rail
PD	Pull-down
PU	Pullup
MC	Micro-controller

5 Schematics

5.1 Main Block Schematic

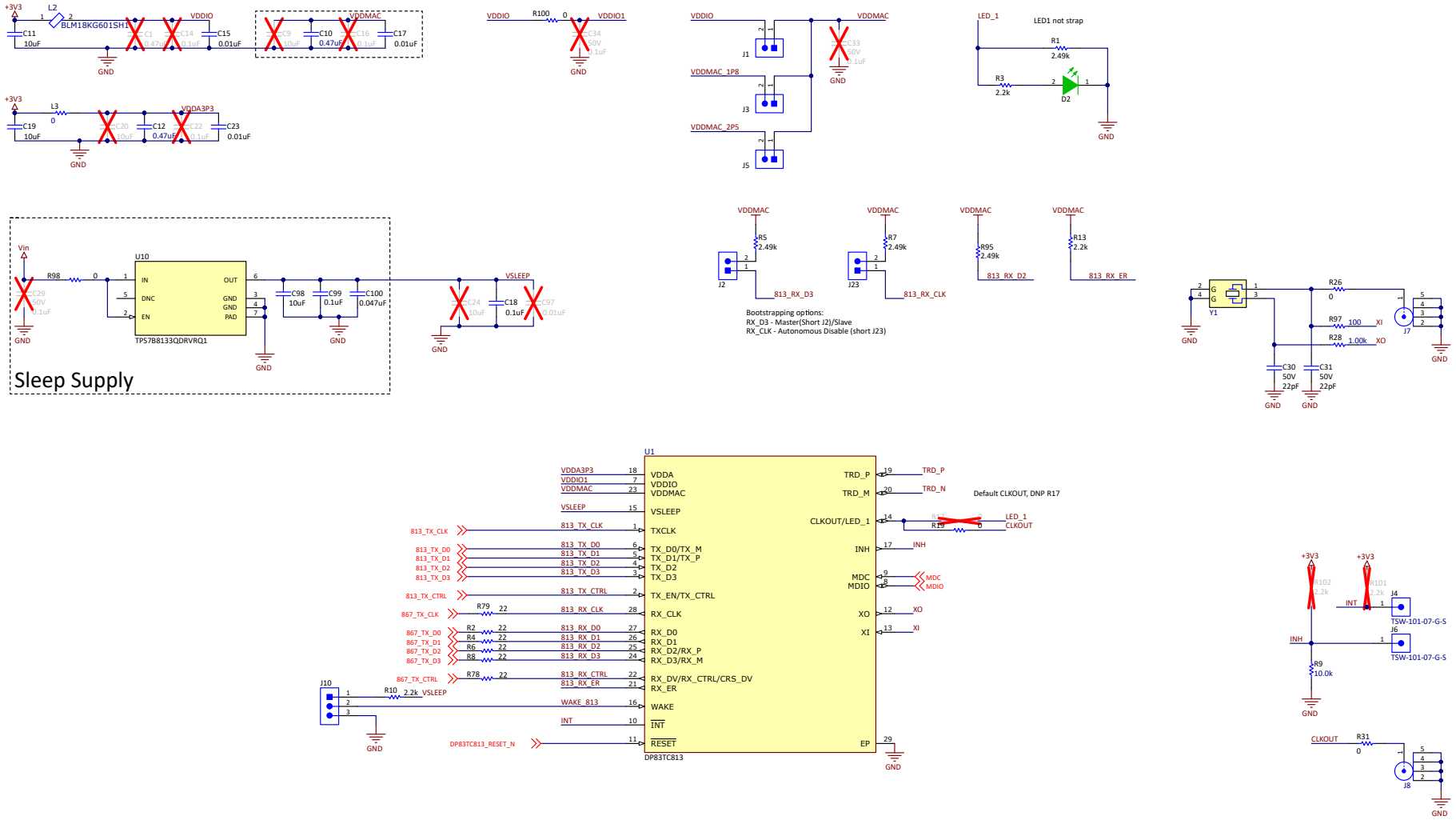


Figure 5-1. Main Schematic

5.2 DP83867 Schematic

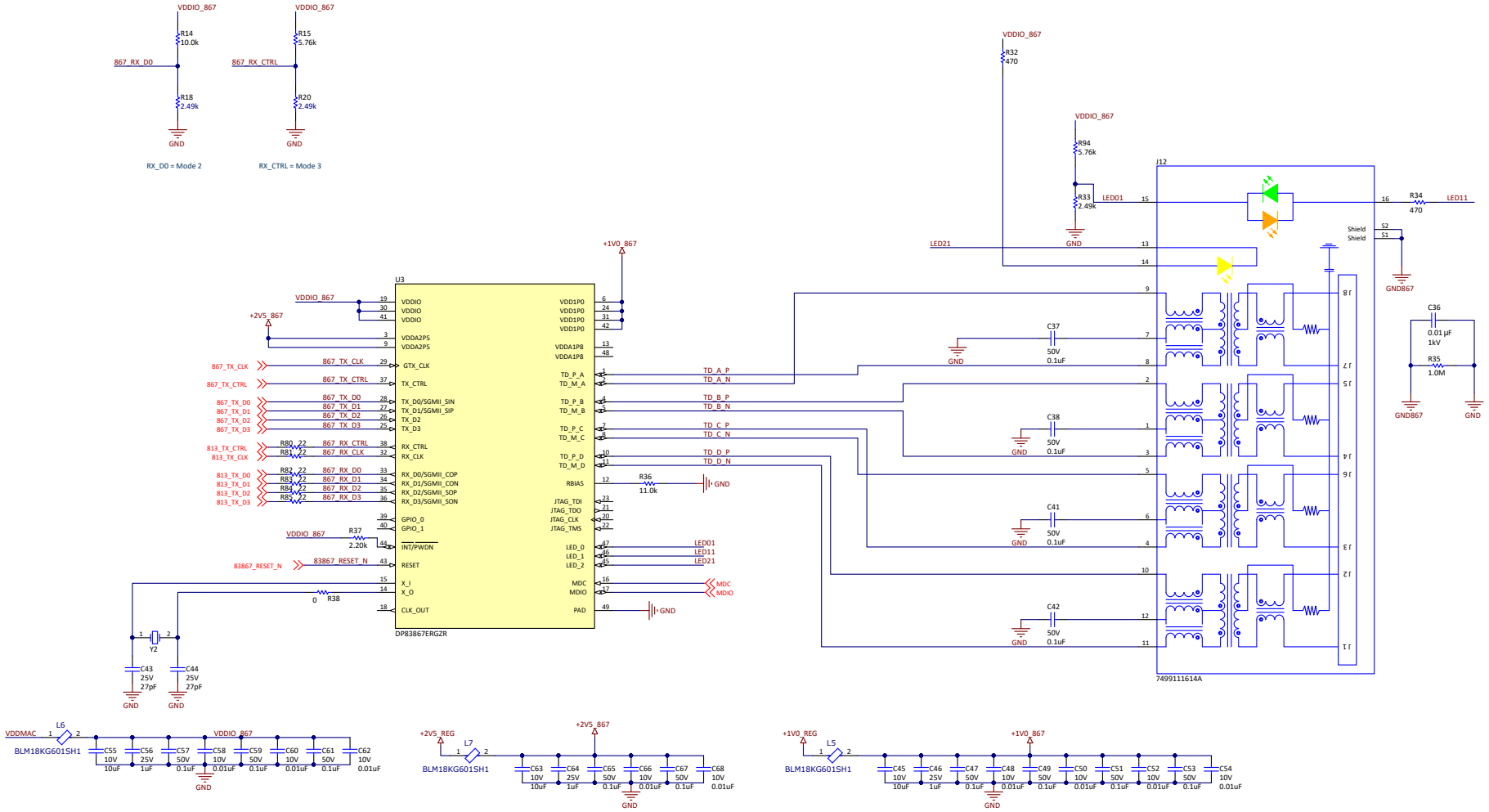


Figure 5-2. DP83867 Schematic

5.3 Power Schematic

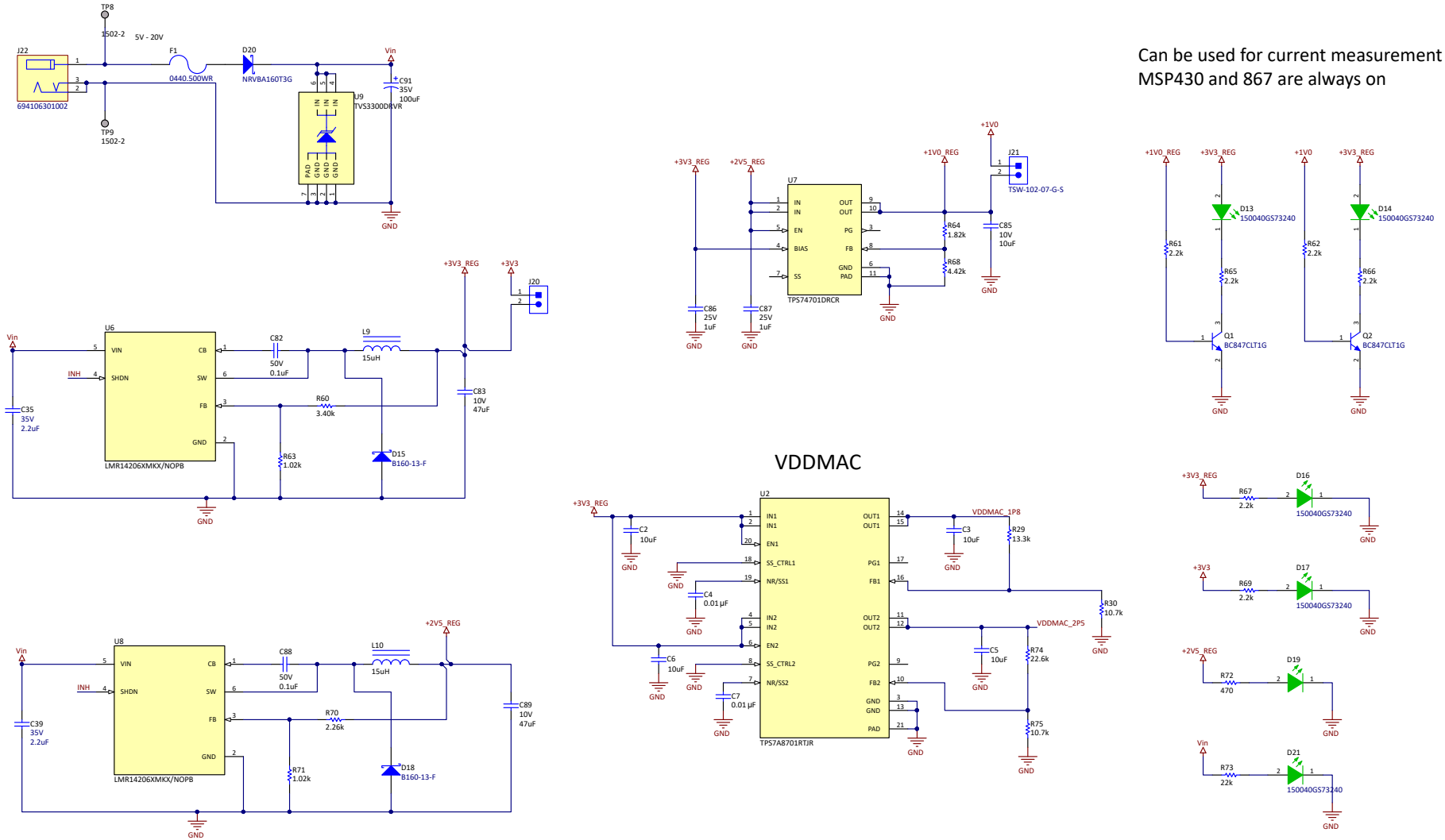


Figure 5-3. Power Schematic

5.4 AFE Schematic

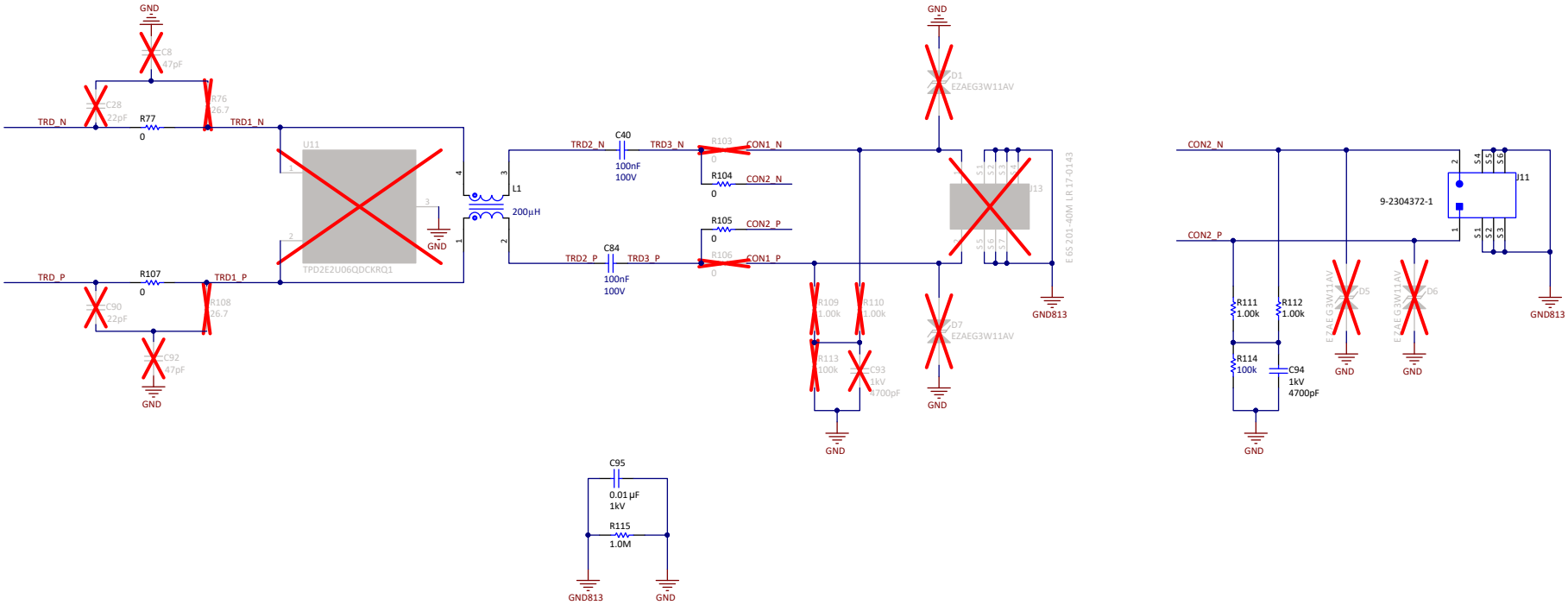


Figure 5-4. AFE Schematic

5.5 Comms Schematic

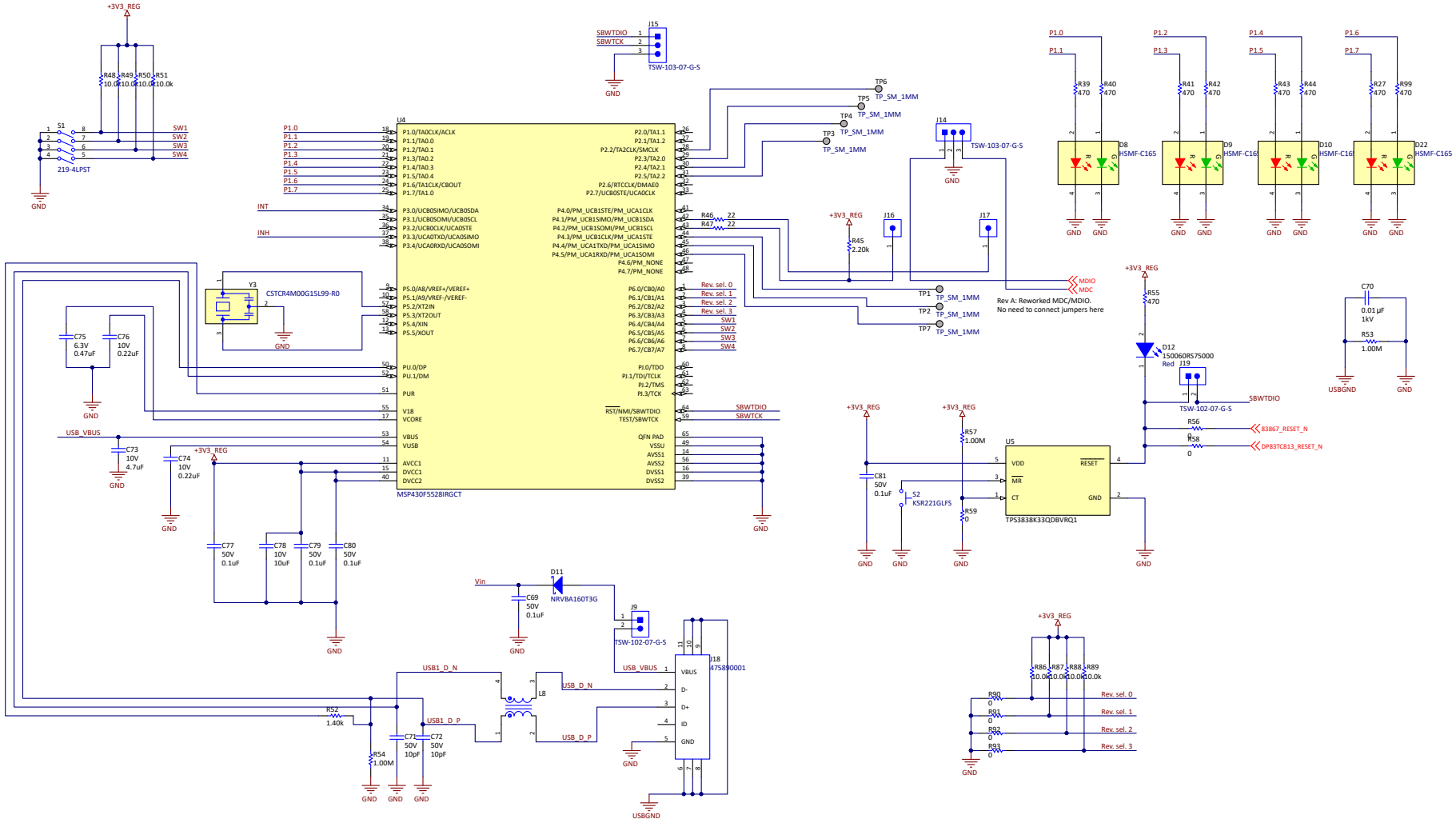
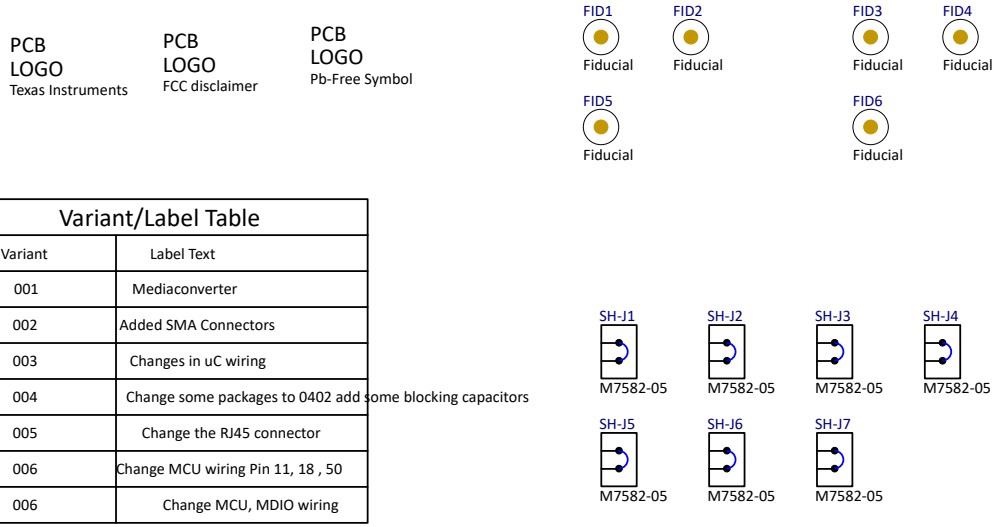


Figure 5-5. Comms Schematic

5.6 Hardware Schematic



Variant/Label Table	
Variant	Label Text
001	Mediaconverter
002	Added SMA Connectors
003	Changes in uC wiring
004	Change some packages to 0402 add some blocking capacitors
005	Change the RJ45 connector
006	Change MCU wiring Pin 11, 18 , 50
006	Change MCU, MDIO wiring

Figure 5-6. Hardware Schematic

6 Layout

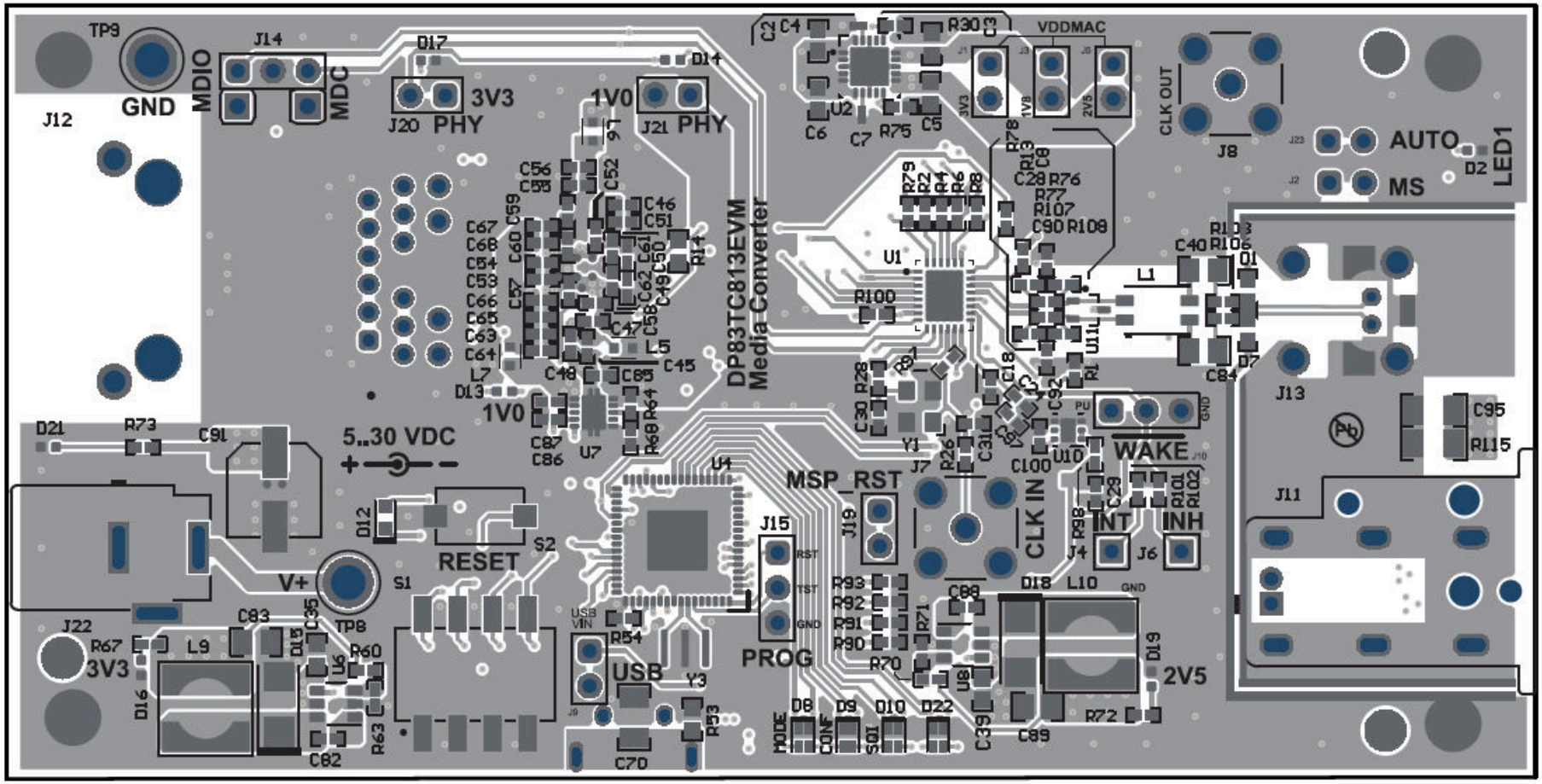


Figure 6-1. Top Overlay

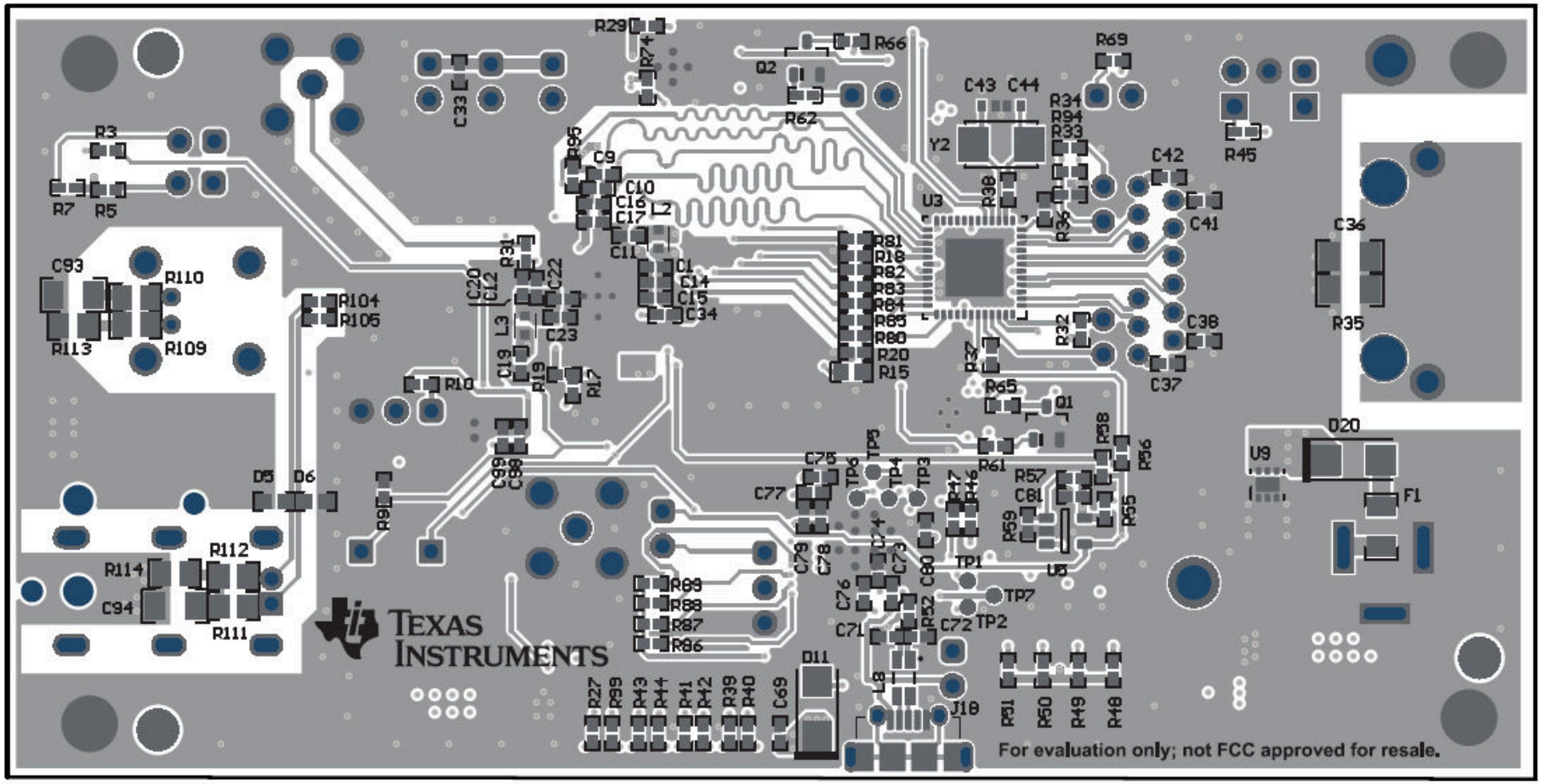


Figure 6-2. Bottom Overlay

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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.

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- *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.*

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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.

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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

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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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4.2 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.

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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.

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