EVM User's Guide: DP83TC815EVM-MC
DP83TC815EVM-MC Evaluation Module

TEXAS INSTRUMENTS

Description

The DP83TC815EVM-MC supports 100Mbps speed and is IEEE 802.3bw compliant. The DP83867 is provided for standard Ethernet (100BASE-TX) support, allowing for media conversion between 100Base-T1 single pair Ethernet and 100Base-TX standard Ethernet. There is an onboard MSP430F5529 for easy register access via the USB2MDIO tool.
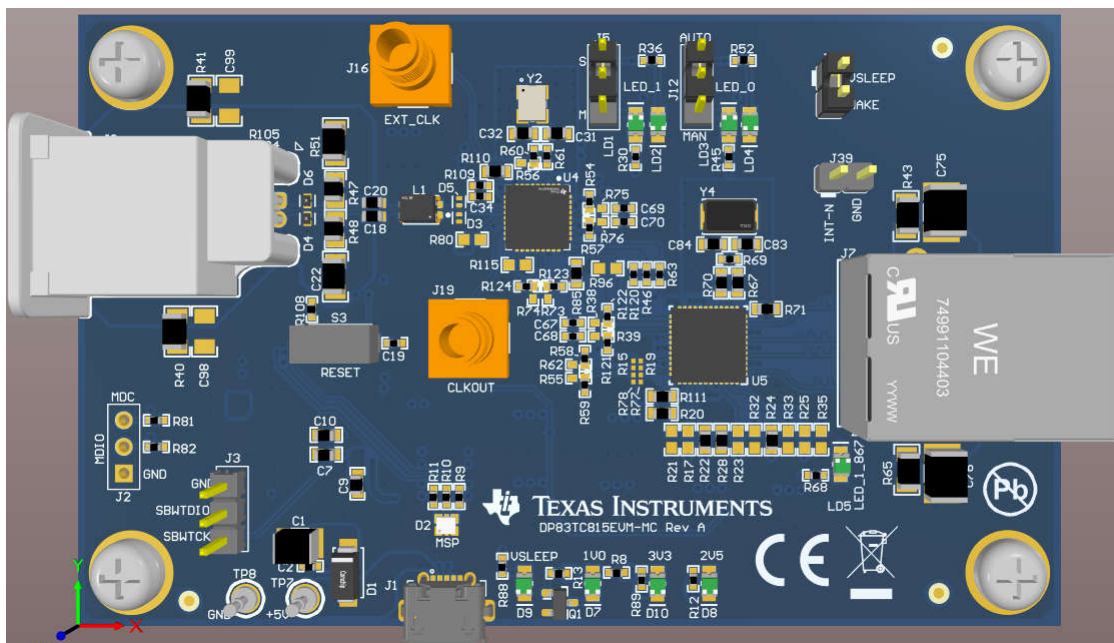
Features

- Media converter: 100BASE-T1 to 100BASE-TX
- RGMII or SGMII back-to-back configuration

- On-board MSP430F5529
  - Plug-and-play USB2MDIO support
- TC10 sleep/wake capability
- Status LEDs
  - Link, activity, power-on, sleep

Applications

- ADAS
  - Radar
- Body electronics and lighting
  - Body control module
  - Zone control module
- Telematics

DP83TC815EVM-MC

1 Evaluation Module Overview

1.1 Introduction

The DP83TC815EVM-MC helps the user evaluate the features of the Texas Instruments DP83TC815 100BASE-T1 PHY. This user's guide details how to properly operate and configure the DP83TC815 Media Converter EVM and includes hardware and software setup instructions.

1.2 Kit Contents

The DP83TC815EVM-MC kit includes with the following:

- DP83TC815EVM-MC

Not supplied:

- Micro-USB cable
- Single pair Ethernet cable with MATEnet adapter
- Standard Ethernet cable

1.3 Specification
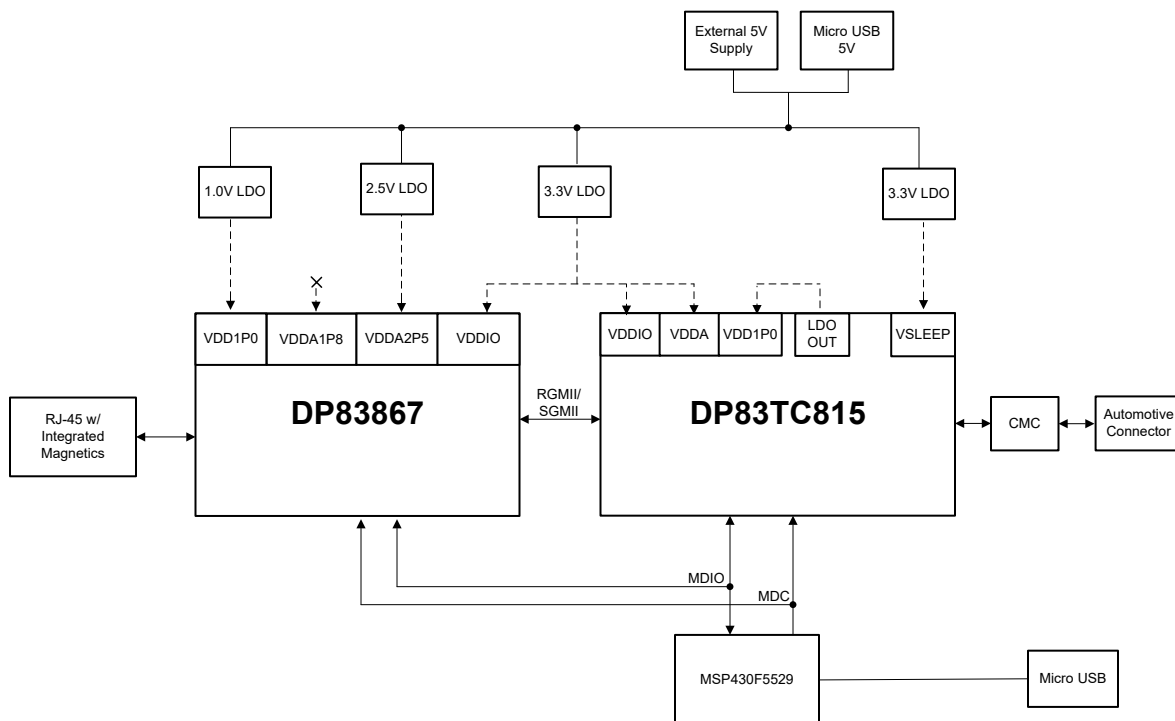
Figure 1-1 shows the block diagram.

Figure 1-1. DP83TC815EVM-MC Block Diagram

1.4 Device Information

Key devices used in DP83TC815EVM-MC are:

- DP83TC815
  - For 100Mbps single pair Ethernet signaling
- DP83867
  - For standard Ethernet signaling
- MSP430F5529
  - For register access of both DP83TC815 and DP83867 via USB2MDIO

2 Hardware

2.1 Operation - Quick Start

1. Connect a micro-USB cable from J1 to any Windows laptop or PC.
2. Open USB-2-MDIO on the laptop or PC.
3. Read register 0x0003 on both onboard PHYs and see that the values match Table 2-1.

Table 2-1. Default Register 0x3 Values

	Register 0x3 Value
DP83TC815 (PHY_ID = 0)	0xA2E0
DP83867 (PHY_ID = 1)	0xA231

4. The board is now ready to connect to a link partner. Connect an additional DP83TC815EVM-MC using a single pair Ethernet cable with MATEnet connectors.
   a. Verify that the master/slave and autonomous/managed selection is configured appropriately (through register write). For more information on bootstrapping, see Section 2.6 for more information.
   b. Ensure the WAKE jumper is installed, otherwise the device is in sleep mode.
   c. Verify the power and link LEDs are on (see Section 2.7).

5. For media conversion, connect a standard Ethernet cable to the RJ45 port (J7).

   Note that DP83867 supports 10/100/1000Mbps link speeds, but only 100Mbps is compatible with this EVM. Connect a 100Mbps link partner, or force the DP83867 to establish 100Mbps link by writing DP83867 register 0x9 = 0x0000 prior to connecting the standard Ethernet cable.
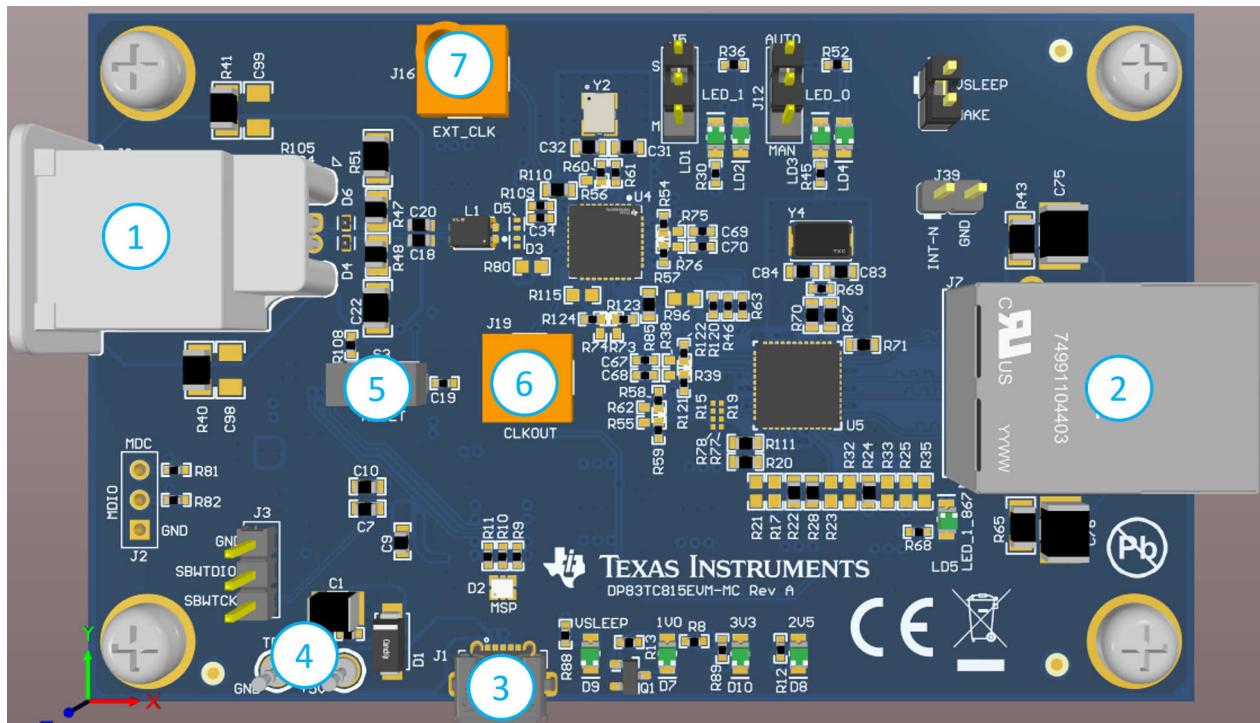
2.2 Board Connections

Figure 2-1. Board Connections

Number	Description
1	MATEnet single pair Ethernet connector
2	RJ45 standard Ethernet connector
3	Micro-USB for power and data
4	5V external power supply option
5	Reset button
6	CLKOUT output of DP83TC815
7	External clock-in option for DP83TC815

2.3 Power Requirements

The DP83TC815EVM-MC can be powered up in two ways:

• Directly connect a micro-USB cable to J1.
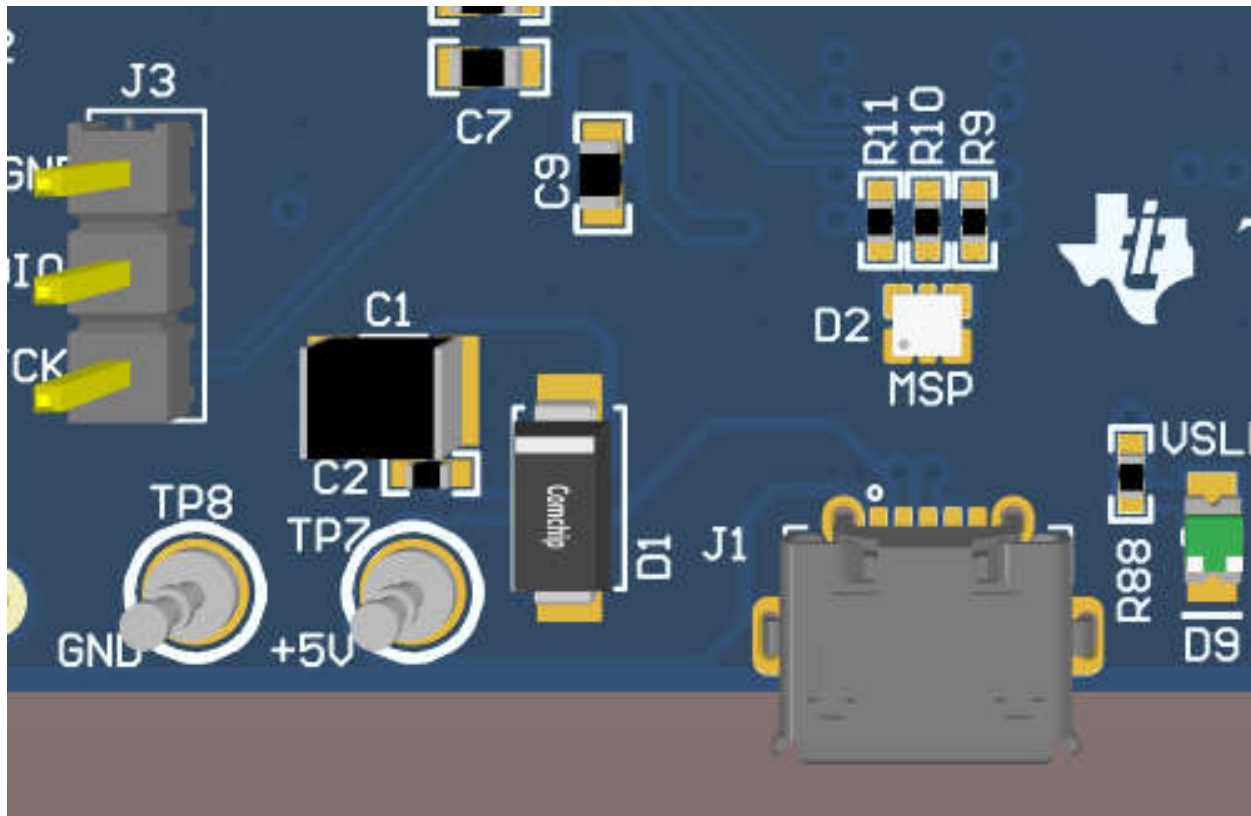• Alternately, connect a 5V power supply to TP7 (+) and TP8 (-).

Figure 2-2. Power Supply Connection

2.4 MSP Connection

- By default, the onboard MSP430 is connected to both PHYs for MDC/MDIO communication.
- To use an external MDC/MDIO connection, remove R81 and R82, then connect MDC, MDIO, and GND to J2.
  - Note that J2 is not populated by default. Install a 3-pin header here for easy external connections, or solder external connections directly to J2 pads.
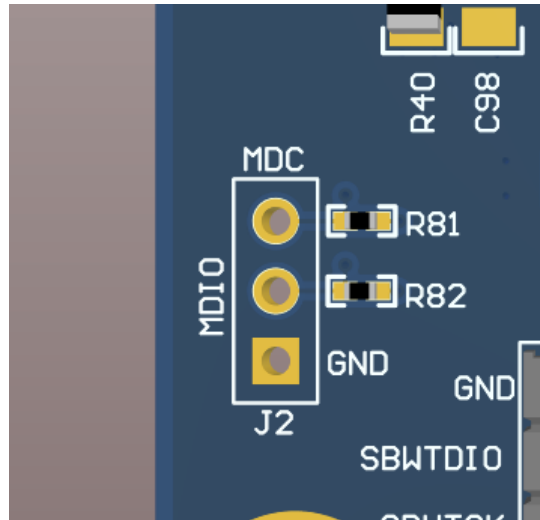

Figure 2-3. MDC/MDIO Connections

2.5 MAC Interface Selection

DP83TC815EVM supports RGMII MAC interface by default. A resistor option is available to configure the media converter to SGMII mode.

To configure SGMII mode:

1. Depopulate R121, R122, R123, R124, R54, R57, R58, R59.
2. Install 0Ω resistors (0402) on R73, R74, R75, R76, R38, R39, R55, R62.
3. Depopulate R84, R85.
4. Install a 10kΩ resistor (0603) on R25 and a 2.49kΩ resistor (0603) on R35.
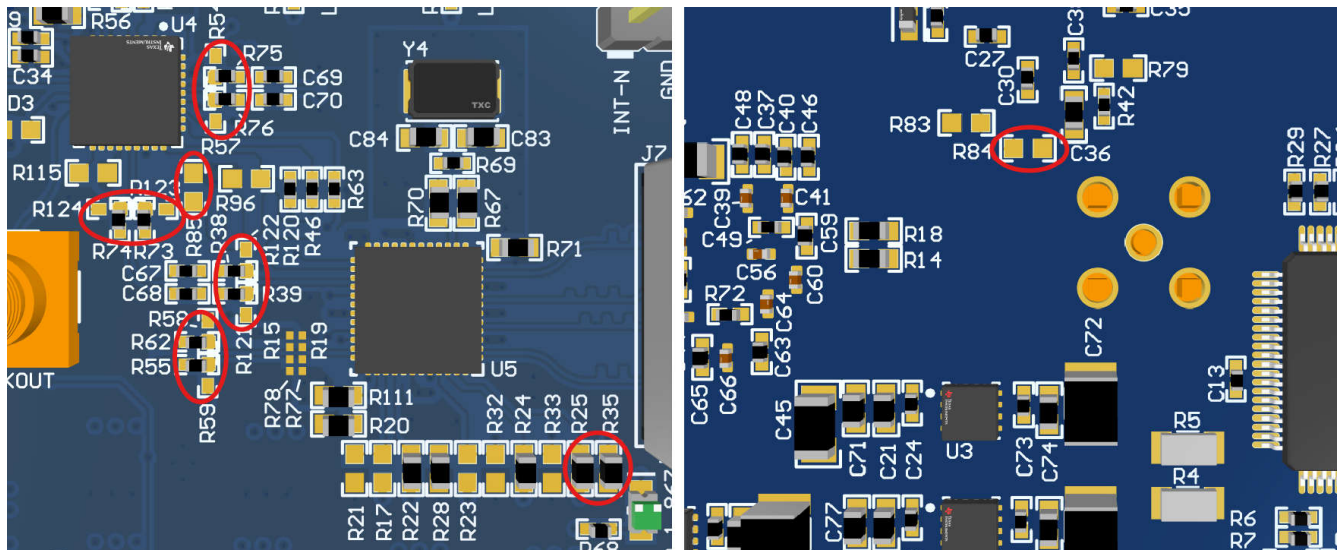
Figure 2-4. SGMII Resistor Option

2.6 Bootstraps and Jumpers

The DP83TC815EVM-MC has headers to configure bootstraps of the PHYs. Autonomous/managed selection and Master/Slave selection is available on J5 and J12, respectively. Note that after changing a jumper setting, the device must be reset to re-sample the new setting. Click the S3 button to reset the PHYs.

Other available headers are J4 (Wake pin), and J39 (Interrupt pin). Keep the jumper on J4 installed to keep the PHY awake. Remove this jumper to allow TC10 sleep mode entry. For more details of using the TC10 sleep/wake feature, see SNLA411.

Note

Revision A boards have misprinted silkscreen on J5 and J12. For the corrected silkscreen, see Figure 2-5.
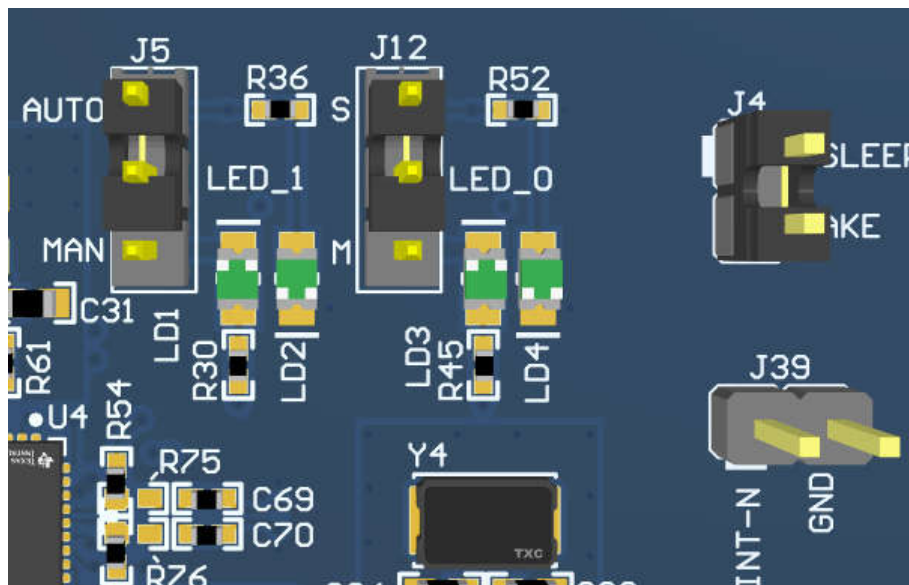
Figure 2-5. Bootstraps and Jumpers (Rev B silkscreen)

2.7 LED Indication

- LED_0 (LD3 or LD4) and LED_1 (LD1 or LD2) illuminate when a link is successfully established on the DP83TC815.
- LED_1 (LD1 or LD2) blinks for TX/RX activity.
- LEDs on the RJ45 connector illuminate when a link is successfully established on the DP83867.

When the device is in sleep mode, only D9 is illuminated.

Note

Verify that DP83867 LED_1 (LD5) is not illuminated when a standard Ethernet cable is connected. This indicates a 1000Mbps link is established, which is not compatible with this 100Mbps media converter. For more information, see Section 2.1, step 5.
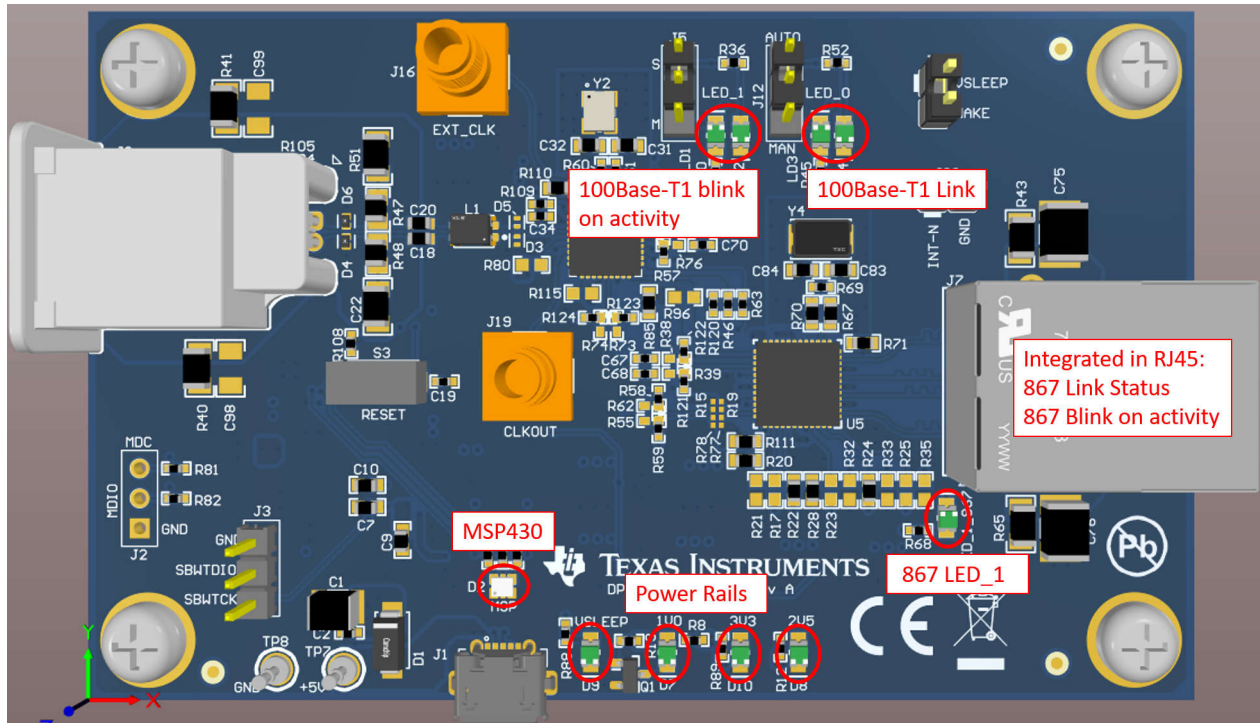

Figure 2-6. LED Indications

2.8 Reference Clock

DP83TC815EVM-MC supports option to use either a crystal oscillator or external clock source as the reference clock. Crystal is populated by default.

To enable the external clock option:

*   Remove R60 and R61.
*   Populate R56 with a 0 ohm resistor (0402).
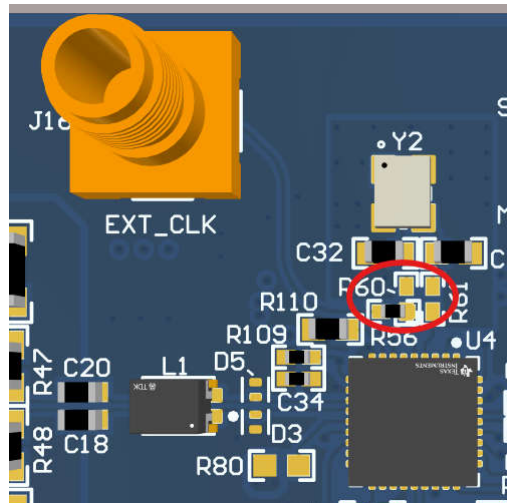*   Connect an external clock source (25Mhz square wave, 3.3V amplitude) to J16 SMA connector.

Figure 2-7. External Reference Clock Option

2.9 MDI Connector

DP83TC815EVM-MC supports multiple connector options for automotive Ethernet. MATEnet is populated by default. An H-MTD connector can be populated, instead, by the following steps.

To populate H-MTD connector:

1. Remove MATEnet connector (J8).
2. Populate 0Ω resistors (0402) on R104, R105.
3. Populate H-MTD connector.
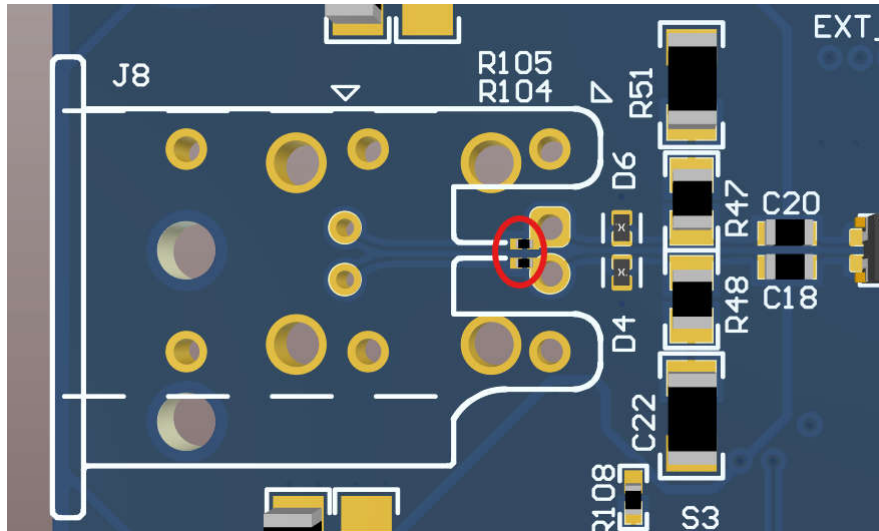
Figure 2-8. H-MTD Connector Installation

3 Software

3.1 GUI Installation

The on-board MSP430 comes preprogrammed 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 registers of the PHY. The software is available to download along with the user's guide in the link: USB2MDIO.

4 Hardware Design Files

4.1 Schematics

Figure 4-1. Schematic: DP83TC815

Figure 4-2. Schematic: DP83867
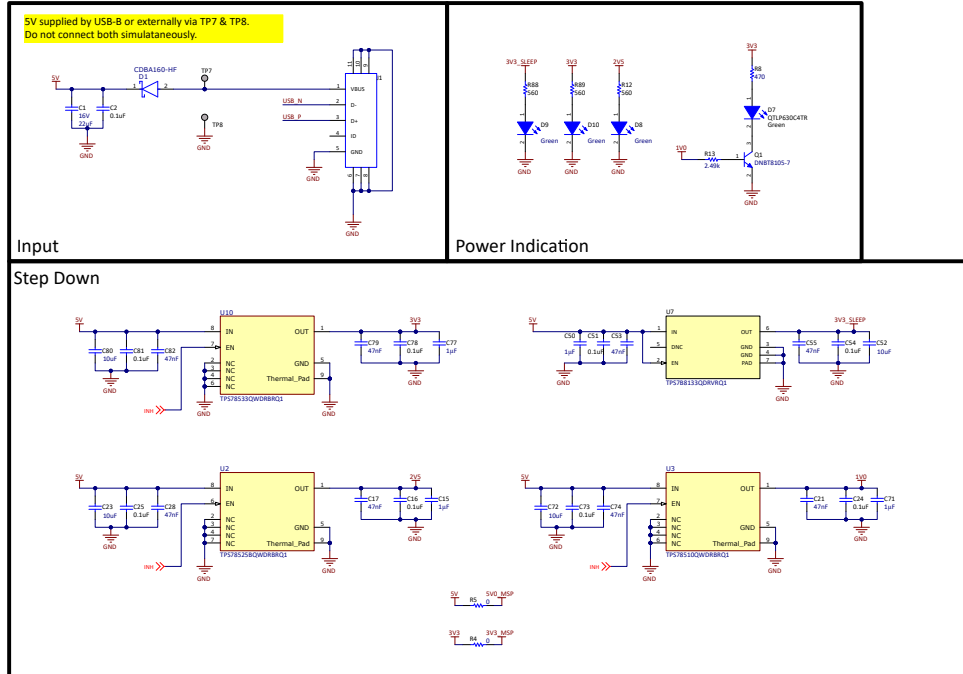
Figure 4-3. Schematic: Power
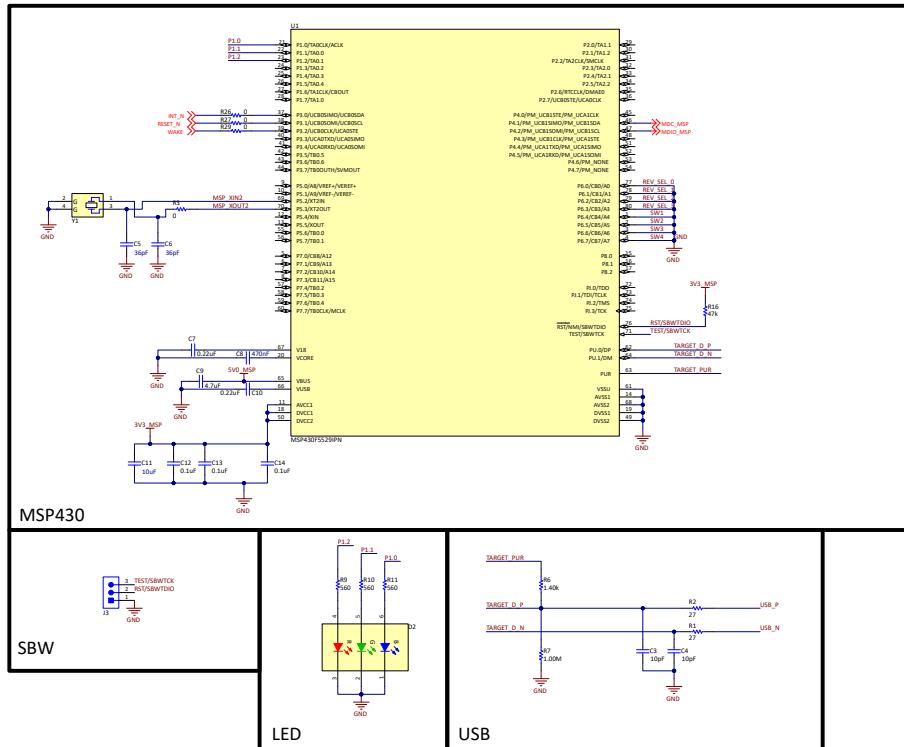
Figure 4-4. Schematic: MSP430

4.2 PCB Layout

To download the PBC guidelines and example layouts, see the DP83TC815EVM-MC webpage.

4.3 Bill of Materials (BOM)

To download the bill of materials (BOM), see the DP83TC815EVM-MC webpage.

5 Additional Information

5.1 Trademarks

All trademarks are the property of their respective owners.

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