*Application Note*

# *DP83848 to DP83826 Hardware Rollover Document*

*Gerome Cacho*

**ABSTRACT**

Texas Instruments offers a variety of Ethernet PHY transceivers which provide designs to multiple end equipment use cases. This application note references the differences between two of the PHYs within the 10/100 Mbps portfolio, DP83848 and DP83826, and how an existing design using DP83848 can be converted to use DP83826.

## Table of Contents



## Trademarks

# 1 Introduction

Texas Instruments Standard Ethernet PHY portfolio consists of various products. A key differentiator within the portfolio is the datarate each PHY is capable of. There are two classes of groups within the portfolio; 10/100/1000 Mbps PHYs and 10/100 Mbps PHYs. DP83848 and DP83826 are two PHYs within the 10/100Mbps category and share common features aside from data rate such as select MAC interfaces, EtherCAT support, and LED control.

This document is inclusive of all versions of DP83848 and DP83826. DP83848 is available in various temperature rated versions in addition to a second footprint. DP83826 is available in two temperature rated versions and has a ModeSelect pin which, depending on the applied voltage at power-on, can change the PHYs operation and pinout. However for this document, only Enhanced mode is discussed.

# 2 Additional Benefits of DP83826

Table 2-1 compares DP83848 against DP83826, DP83826 to provide additional benefits to the system:

**Table 2-1. Comparing DP83848 against DP83826, DP83826**

| DP83826 Benefits | DP83848 | DP83826 |
|---|---|---|
| Lower power consumption | 264-267mW | 221.1mW under similar conditions, but even more savings by using 1.8V VDDIO |
| Lower latency | Transmit Latency: 60ns<br>Receive Latency: 240ns | Transmit Latency: 40ns<br>Receive Latency: 170ns |
| Additional RMII Configuration | MII, RMII Slave, SNI | MII, RMII Master, RMII Slave |
| Smaller BOM requirements | 17-19, with tantalum capacitor on PFB network | 9, with all ceramic capacitors |
| Smaller footprint | 48-pin LQFP (7x7 mm)<br>40-pin WQFN (6x6 mm). | 32-pin QFN (5x5 mm) |
| More LED functionality | 2-3 | Up to 4 |
| Feature-richer | BIST | DP83848 features plus:<br>Fast Link Drop for sensitive link, beneficial in real-time applications<br>Wake-on-LAN, Energy Efficient Ethernet for various system low power modes |

**Note**

Power consumption and latency data based upon specific configuration, operating temperature, and data traffic

# 3 Hardware Differences

## 3.1 Power Supply and Special Connection Requirements

DP83848 utilizes a 3.3V supply for both analog and digital supplies. DP83826 provides an option to have the digital supply at 1.8V for wider compatibility and power savings.

For power supply decoupling, DP83848 requires a 100nF per supply pin and a 10µF capacitor as shown in Figure 3-1 while DP83826 requires a network of 10nF, 100nF, 1µF, and 10µF per supply pin as shown in Figure 3-2.

For special connections required for operation, both PHYs have an RBias pin. DP83848 requires a 4.87kΩ while DP83826 requires a 6.49kΩ. DP83848 requires an additional three 100nF and a 10µF decoupling capacitor between PFBIN/PFBOUT (shorted together) pins and GND as shown in Figure 3-3. The LQFP DP83848 also requires a 2.2kΩ from pins 20 and 21 (Reserved) to AVDD33.

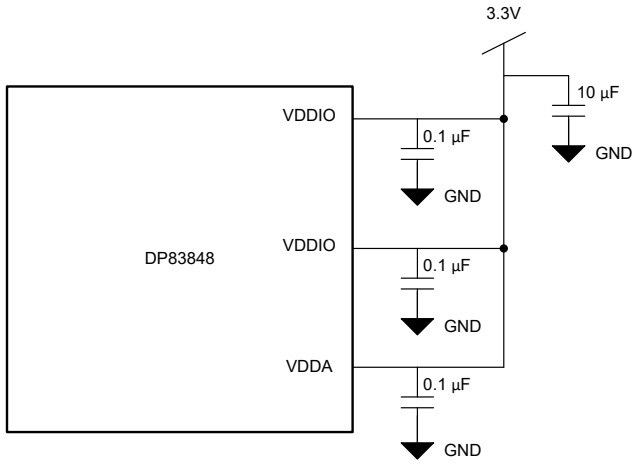


**Figure 3-1. DP83848 Decoupling Network**

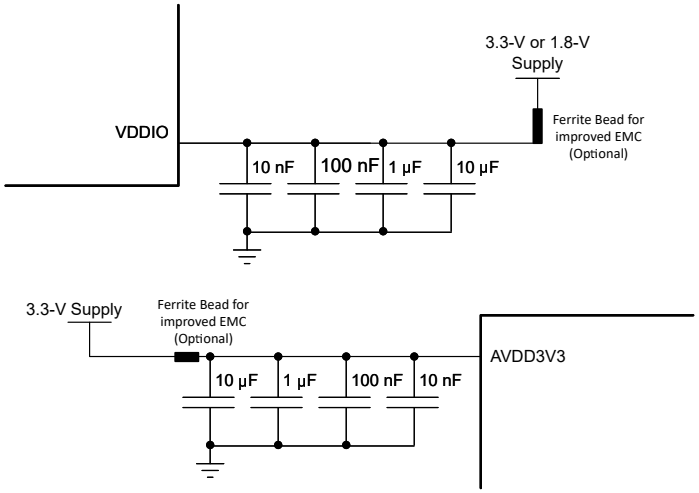


**Figure 3-2. DP83826 Decoupling Network**

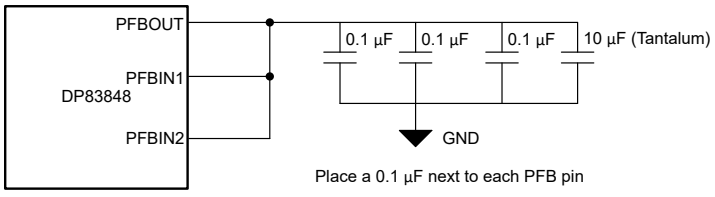


**Figure 3-3. DP83848 PFB Network**

## 3.2 Media Dependent Interface Requirements

DP83848 is a current-mode driver and thus requires a 50OHM resistor connection between each MDI pin and AVDD33. There is also a requirement of a 100nF decoupling capacitor from AVDD33 and GND near the pullup resistors as shown in Figure 3-4. DP83826 is a voltage-mode driver and does not require these extra components as shown in Figure 3-5.

Both PHYs can use the same discrete transformers as both PHYs share the same recommendations regarding electrical specifications. However, DP83826 has a recommended configuration of center tap decoupling caps of 2nF per channel, while DP83848 has a recommended configuration of center tap shorting between channels and pulling up to AVDD33 with a 100nF decoupling cap per channel.

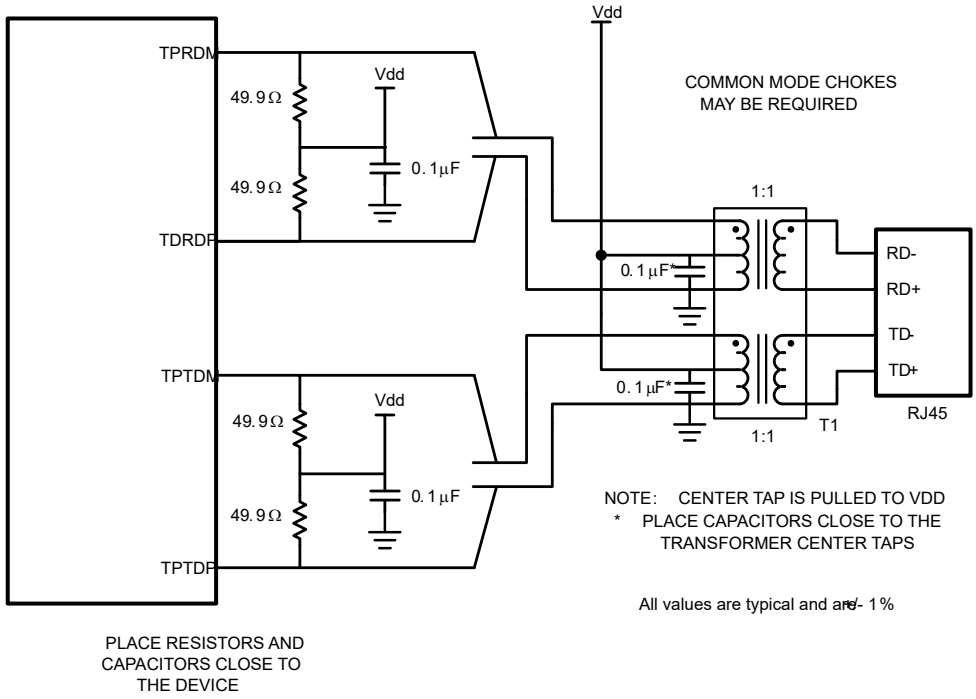


**Figure 3-4. DP83848 MDI Network**

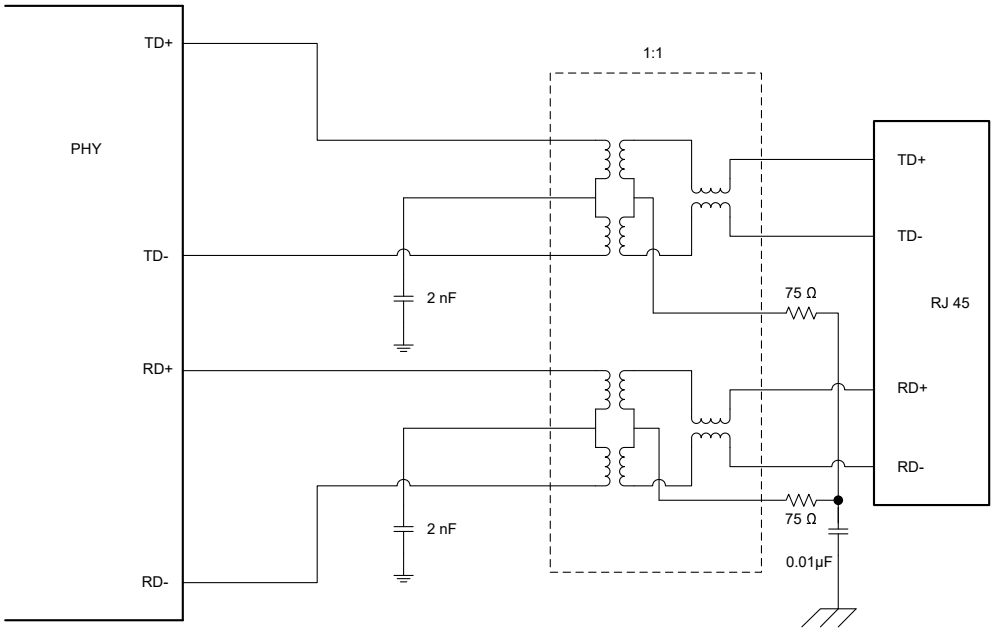


**Figure 3-5. DP83826 MDI Network**

## 3.3 Hardware Strapping

DP83848 and DP83826 share some common strappable configurations as shown in Table 3-1. Pin numbers are shown in ( ):

**Table 3-1. DP83848 and DP83826 Common Strappable Configurations**

| PHY | DP83848 LQFP | DP83848 QFN | DP83826 |
|---|---|---|---|
| PHY Address [0] | COL (42) | COL (35) | LED0 (30) |
| PHY Address [1] | RX_D0 (43) | RX_D0 (36) | CRS/LED3 (29) |
| PHY Address [2] | RX_D1 (44) | RX_D1 (37) | COL/LED2 (28) |
| Auto-Negotiation Enable | LED_ACT/COL (26) | N/A | RX_D0 (16) |
| Auto-MDIX Enable | RX_ER (41) | RX_ER (34) | RX_D1 (15) |
| MAC Interface | RX_DV (39)<br>TX_D3 (6) | RX_DV (32) | RX_D2 (14) (If strapped Odd Nibble enabled) |

DP83848 has some exclusive functions that can be strapped as described in Table 3-2. Pin numbers are shown in ( ):

**Table 3-2. DP83848 Exclusive Functions**

| PHY | DP83848 LQFP | DP83848 QFN |
|---|---|---|
| PHY Address [3] | RX_D2 (45) | RX_D2 (38) |
| PHY Address [4] | RX_D3 (46) | RX_D3 (39) |
| Speed/Duplex Configuration | LED_SPEED (27)<br>LED_LINK (28) | LED_SPEED (21)<br>LED_LINK (22) |
| LED Configuration | CRS (40) | CRS (33) |

DP83826 has some exclusive functions that can be strapped as described in Table 3-3. Pin numbers are shown in ( ):

**Table 3-3. DP83826 Exclusive Functions**

| Strap | DP83826 Pin Name (Number) |
|---|---|
| Manual MDI/MDIX Configuration (Applicable if Auto-MDIX is disabled) | RX_DV (18) |
| CLKOUT Functionality | RX_ER (20) |
| Odd Nibble Enable | CLKOUT/LED1 (31) |
| Type of RMII | TX_CLK (22) |
| RMII Repeater | RX_D3 (13) (if strapped to RMII) |
| Fast Link Drop Configuration | RX_D3 (13) (if strapped to MII) |
| Signal Detect Configuration of Fast Link Drop | RX_D2 (14) (if strapped to Odd Nibble Disable with FLD enabled) |

As there are many dependencies in DP83826 for bootstrapping, Figure 3-6 can help decipher the different configurations available.

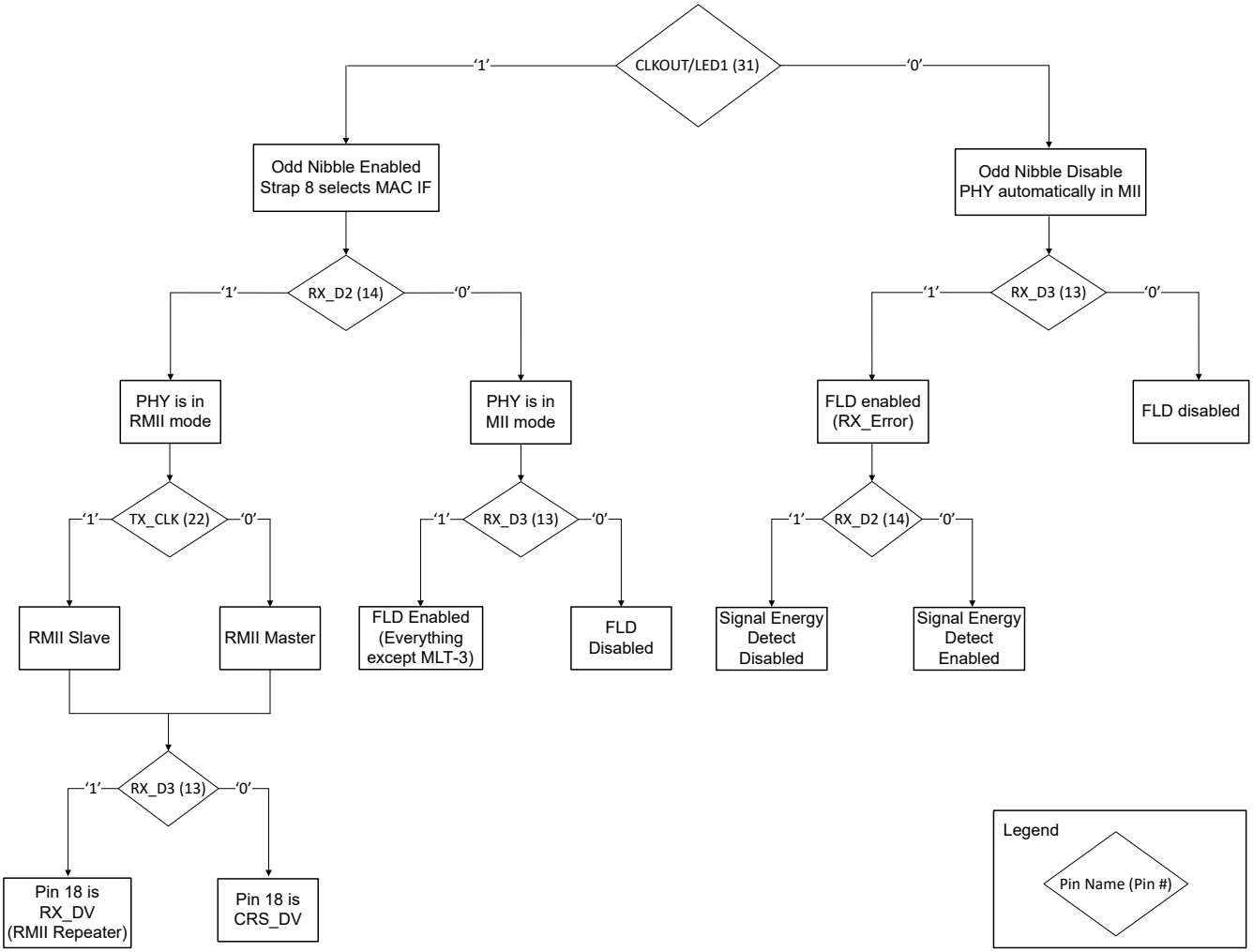


**Figure 3-6. DP83826 Enhanced Mode Strapping Flowchart**

## 4 Summary

DP83826 and DP83848 are similar 10/100 Mbps PHYs which can be used in similar applications. This document notes the similarities and differences between them from an implementation perspective. Strapping, MDI network, power-supply decoupling network, and special connection networks can be the immediate focus when identifying the hardware changes between devices.

## 5 References


- Texas Instruments, *DP83848C/I/VYB/YB PHYTER™ QFP Single Port 10/100 Mb/s Ethernet Physical Layer Transceiver*, data sheet.
- Texas Instruments, *DP83848x PHYTER Mini / LS Single Port 10/100 MB/s Ethernet Transceiver*, data sheet.
- Texas Instruments, *DP83826 Deterministic, Low-Latency, Low-Power, 10/100 Mbps, Industrial Ethernet PHY*, data sheet.

# IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265