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## 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 10/100Mbps portfolio, DP83848 and DP83826A, and how an existing design using DP83848 can be converted to use DP83826A.

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## 1 Introduction

Texas Instruments Standard Ethernet PHY portfolio consists of various products. A key differentiator within the portfolio is the data rate each PHY is capable of. There are two classes of groups within the portfolio; 10/100/1000Mbps PHYs and 10/100 Mbps PHYs. DP83848 and DP83826A 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 DP83826A. DP83848 is available in various temperature rated versions in addition to a second footprint. DP83826A 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 DP83826A

[Table 2-1](#) compares DP83848 against DP83826A which provides additional benefits to the system:

**Table 2-1. Comparing DP83848 Against DP83826A**

| DP83826A Benefits            | DP83848  | DP83826A   |
|------------------------------|--|--|
| 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 RMI Configuration | MII, RMI Follower, SNI                           | MII, RMI Leader, RMI Follower  |
| 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

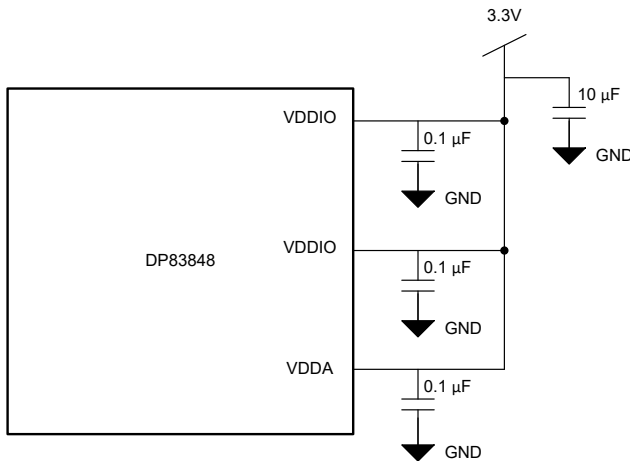
### 3 Hardware Differences

#### 3.1 Power Supply and Special Connection Requirements

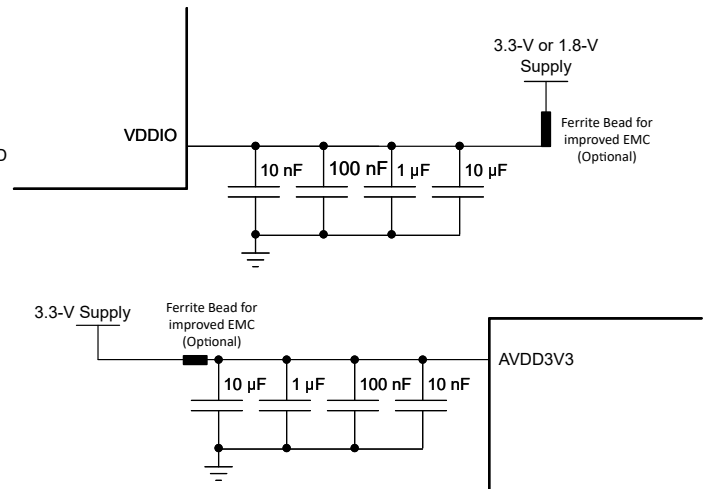
DP83848 utilizes a 3.3V supply for both analog and digital supplies. DP83826A provides an option to have the digital supply at 1.8V for wider compatibility and power savings.

For power supply decoupling, DP83848 requires a 100nF per supply pin and a 10μF capacitor as shown in [Figure 3-1](#) while DP83826A requires a network of 10nF, 100nF, 1μF, and 10μF per supply pin as shown in [Figure 3-2](#).

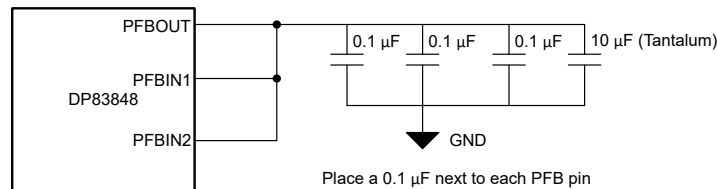
For special connections required for operation, both PHYs have an RBIAS pin. DP83848 requires a 4.87kΩ while DP83826A requires a 6.49kΩ. DP83848 requires an additional three 100nF and a 10μF decoupling capacitor between PFBIN/PFBOUT (shorted together) pins and GND as shown in [Figure 3-3](#). The LQFP DP83848 also requires a 2.2kΩ from pins 20 and 21 (Reserved) to AVDD33.



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



**Figure 3-2. DP83826A Decoupling Network**

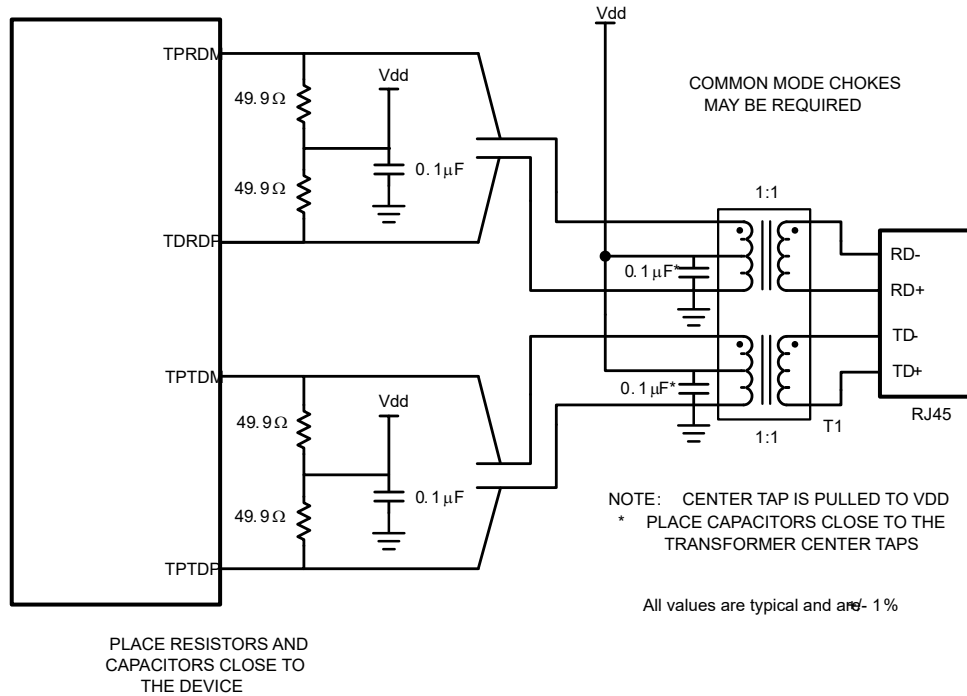


**Figure 3-3. DP83848 PFB Network**

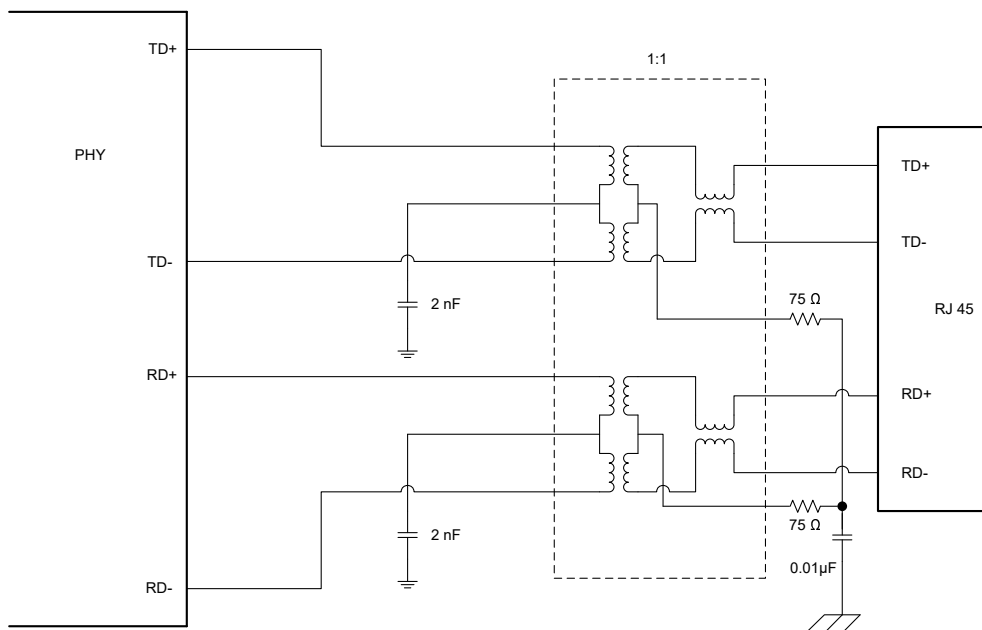
### 3.2 Media Dependent Interface Requirements

DP83848 is a current-mode driver and thus requires a 50Ω 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. DP83826A 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, DP83826A 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 capacitor per channel.



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



**Figure 3-5. DP83826A MDI Network**

### 3.3 Hardware Strapping

DP83848 and DP83826A share some common strappable configurations as shown in [Table 3-1](#). Pin numbers are shown in [Table 3-3](#).

**Table 3-1. DP83848 and DP83826A Common Strappable Configurations**

| PHY                     | DP83848 LQFP            | DP83848 QFN | DP83826A                                    |
|-------------------------|-------------------------|-------------|---|
| 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 3-3](#).

**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)                        |

DP83826A has some exclusive functions that can be strapped as described in [Table 3-3](#). Pin numbers are shown in [Table 3-3](#).

**Table 3-3. DP83826A Exclusive Functions**

| Strap   | DP83826A 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)<br>RX_CLK (19)<br>RX_D2 (14) (if strapped to Odd Nibble Disable with FLD enabled) |

As there are many dependencies in DP83826A for bootstrapping, [Figure 3-6](#) can help decipher the different configurations available.

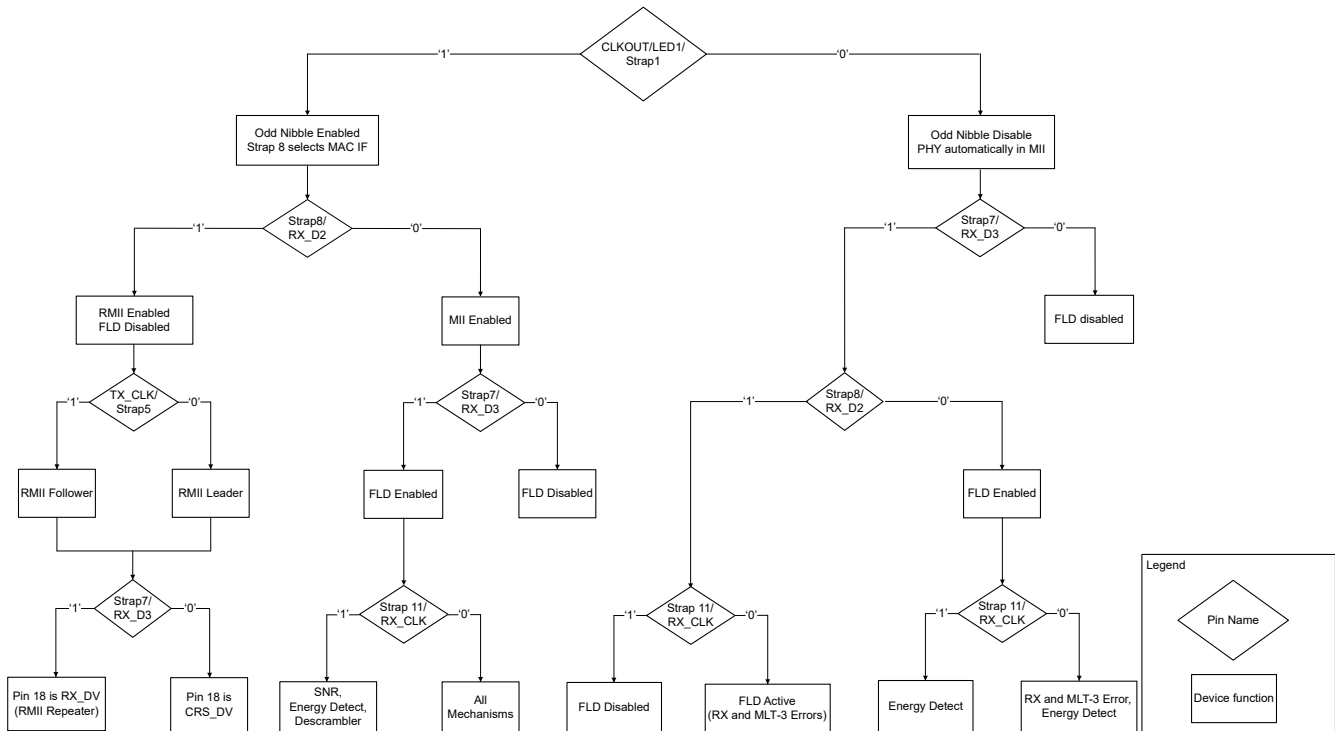


Figure 3-6. DP83826A Enhanced Mode Strapping Flowchart

## 4 Summary

DP83826A and DP83848 are similar 10/100Mbps 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, [DP83826Ax Deterministic, Low-Latency, Low-Power, 10/100 Mbps, Industrial Ethernet PHY](#), data sheet.

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