User's Guide

DP83867 SFP Application Interface Card

ABSTRACT

This user's guide describes the design, setup, and function of the DP83867 Single-Port TSN Small Form-factor Pluggable (SFP) Application Interface Card (AIC). The SPF AIC supports one Ethernet port with 1000/100/10 Mb/s and is compliant with the IEEE 802.3 standard. This reference design supports SGMII for MAC connections.

The SFP AIC card can be interfaced to the Intel Raptor Lake-P CRB (COM-HPC) design.

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Trademarks

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1 Introduction

1.1 Overview

Figure 1-1. DP83867 Single-Port TSN SFP Application Interface Card (Top View)

Figure 1-2. DP83867 Single-Port TSN SFP Application Interface Card (Bottom View)

The DP83867 Single-Port TSN SFP Application Interface Card plugs into the Intel Raptor Lake reference design through the SFP interface connector. This is an easy way to evaluate the functionality of the DP83867 Ethernet PHY with the Intel CPU reference design.

The SFP form factor carries the SGMII signaling for the Ethernet port, MDIO/MDC, power supply and control signals.

The AIC supports MDIO access via dedicated a SMI interface over the SFP interface. The DP83867 PHY use the MDIO addresses 0 to be addressed via the SMI interface.

1.2 Hardware Features

DP83867 Single-Port TSN SFP Application Interface Card features:

- DP83867 Gbit Ethernet PHY
- SGMII MAC interface
- Common serial management interface (SMI) with MDIO/MDC signals to access DP83867 Ethernet PHY
- One RJ45 jack connector
- Discrete magnetics
- On-board power generation for all PHYs, sourced by 3.3 V power supply through the SFP connector

1.3 Software Features

- The Ethernet PHY MDIO registers can be accessed via the SFP interface.
  - DP83867 on Ethernet port has MDIO address #0

1.4 Block Diagram

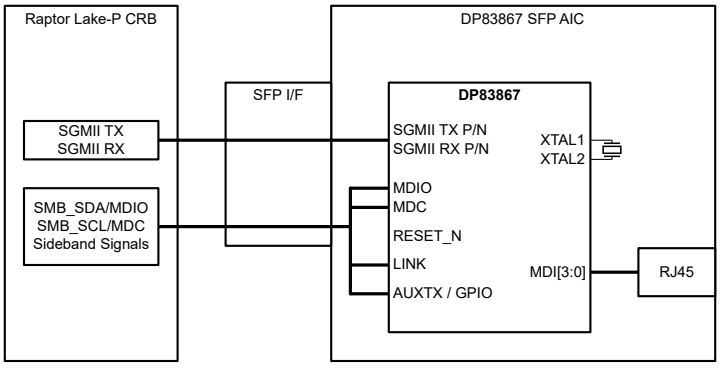

Figure 1-3. Block Diagram

2 Board Overview

2.1 Components

Figure 2-1 below gives a quick overview of the AIC board. The marked sections are described in the Table 2-1.

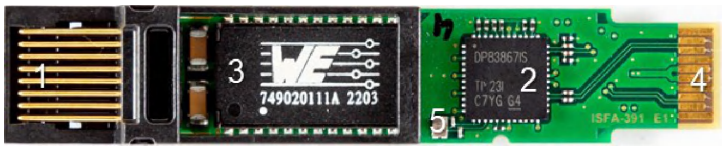

Figure 2-1. Connectors, Jumpers and LEDs

Table 2-1. Component Table

Section	Description
1	RJ45 Gigabit Ethernet network connection Port 1 / TSN_0
2	DP83867 PHY1 for Port 1
3	Ethernet magnetic
4	SFP interface
5	25 MHz clock generation for PHY

2.2 SFP Header Signals

Please refer to the schematics in section Section 4.2 for the SFP signal assignment and description. The signal assignment is following the signal layout of the Intel host platform.

2.2.1 MISC0 Signal Header

Table 2-2. SFP Signal Header

Pin Number	Signal Description
12	SGMII_SFP_RX_D_N / SGMII_SON
13	SGMII_SFP_RX_D_P / SGMII_SOP
18	SGMII_SFP_TX_D_P / SGMII_SIP
19	SGMII_SFP_TX_D_N / SGMII_SIN
8	LINK
2	PHY GPIO_0 / SFP_AUX_TS
4	MDIO
5	MDC
6	SFP_MD_0, connected to GND
3, 7, 9	Not connected
1, 10, 11, 14, 17, 20	GND
15, 16	3.3V supply

3 Quick Start

1. Power down the Intel host platform (e.g Intel Raptor Lake).
2. Plug-in the DP83867 Single-Port TSN SFP Application Interface Card into the Intel host platform.
3. Power up the Intel host platform.

4 Schematic, Board Layout, and Bill of Materials

4.1 Board Layout

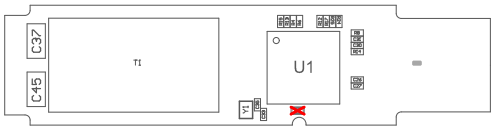

Figure 4-1. Assembly Drawing Top Layer

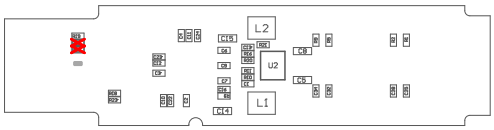

Figure 4-2. Assembly Drawing Bottom Layer

4.2 Schematic

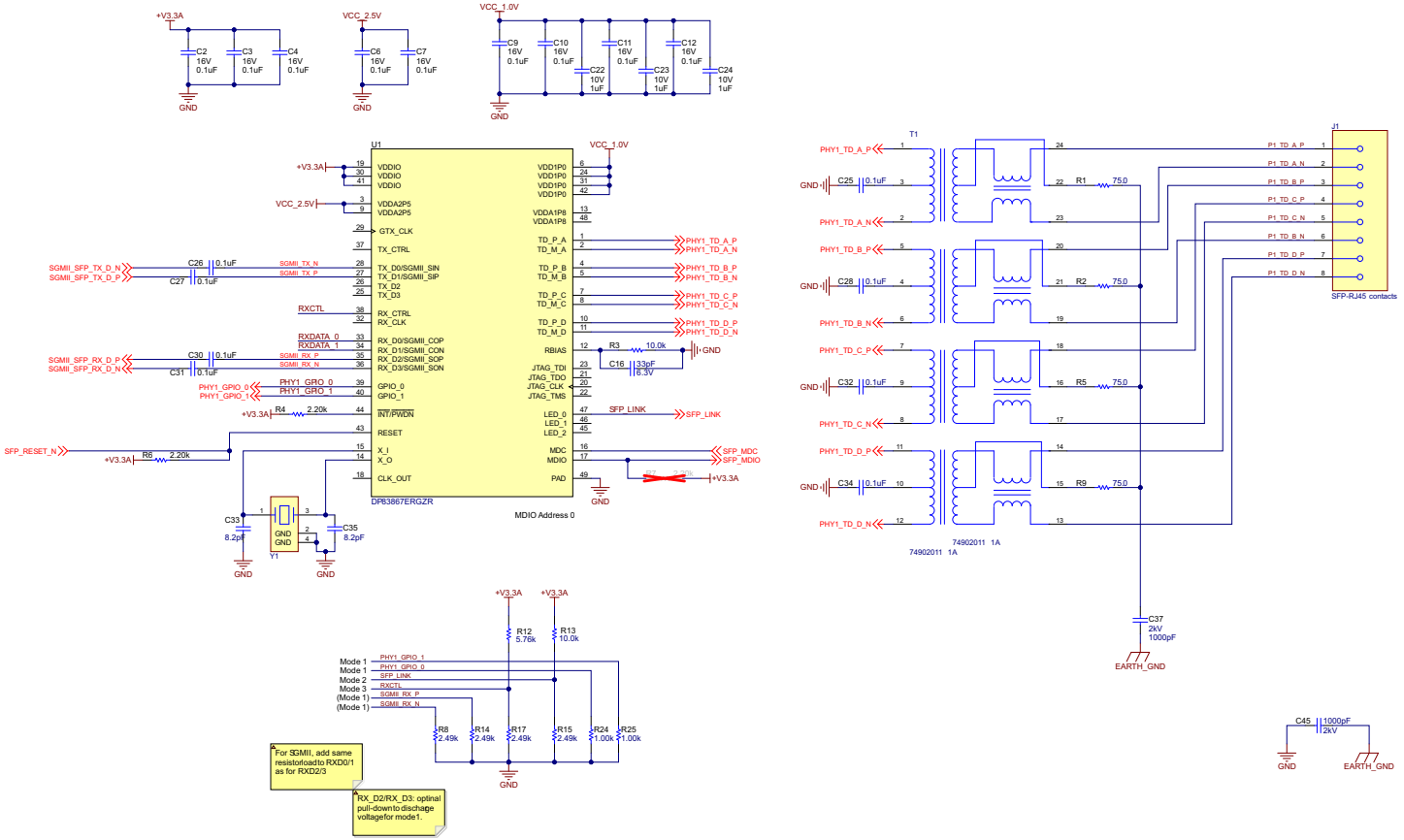

Figure 4-3. Schematic : DP83867 Ethernet PHY

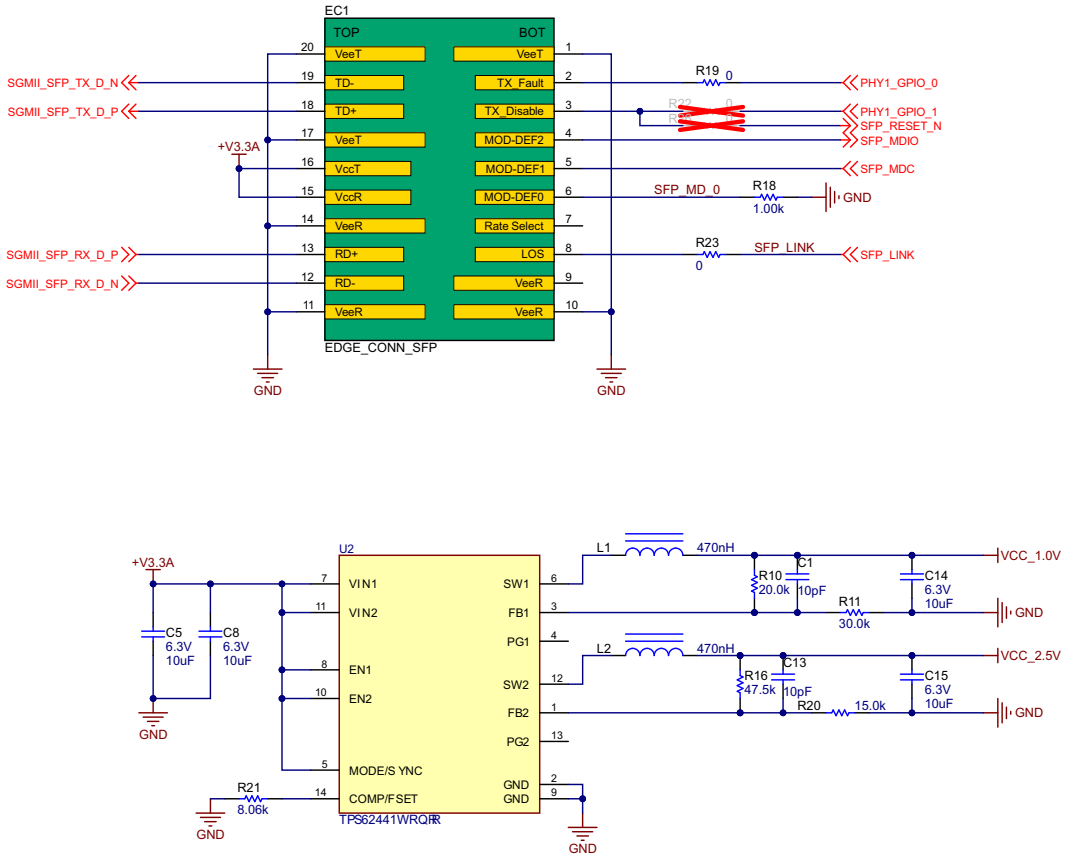

Figure 4-4. Schematic : SFP Interface and Power

4.3 Bill of Materials

Table 4-1. Bill of Materials

Designator	Qty	Part Number	Description	Footprint
C1, C13	2	GJM0335C1E100JB01D	CAP, CERM, 10 pF, 25 V, +/- 5%, C0G/NP0, 0201	201
C2, C3, C4, C6, C7, C9, C10, C11, C12, C26, C27, C30, C31	13	GRM033C71C104KE14D	CAP, CERM, 0.1 uF, 16 V, +/- 10%, X5R, 0201	201
C5, C8, C14, C15	4	GRM155R60J106ME11	CAP, CERM, 10 uF, 6.3 V, +/- 20%, X5R, 0402	402
C16	1	GJM0335C0J330JB01D	CAP, CERM, 33 pF, 6.3 V,+/- 5%, C0G/NP0, 0201	201
C22, C23, C24	3	GRM033R61A105ME15D	CAP, CERM, 1 uF, 10 V,+/- 20%, X5R, 0201	201
C25, C28, C32, C34	4	GRM033C71A104KE14D	CAP, CERM, 0.1 uF, 10 V,+/- 10%, X7S, 0201	201
C33, C35	2	GRM0335C1E8R2BA01D	CAP, CERM, 8.2 pF, 25 V,+/- 1.2%, C0G/NP0, 0201	201
C37, C45	2	C1206C102KGRACAUTO	CAP, CERM, 1000 pF, 2000 V, +/- 10%, X7R, AEC-Q200 Grade 1, 1206	1206
L1, L2	2	DFE252012PD-R47M	Inductor, Shielded, 470 nH, 4.7 A, 0.021 ohm, SMD	1008
R1, R2, R5, R9	4	RC0201FR-0775RL	RES, 75.0, 1%, 0.05 W, 0201	201
R3	1	RC0201FR-0710KL	RES, 10.0 k, 1%, 0.05 W, 0201	201
R4, R6	2	CRCW02012K20FKED	RES, 2.20 k, 1%, 0.05 W, 0201	201
R8, R14, R15, R17	4	CRCW02012K49FKED	RES, 2.49 k, 1%, 0.05 W, 0201	201
R10	1	RC0201FR-7D20KL	RES, 20.0 k, 1%, 0.05 W, 0201	201
R11	1	RC0201FR-0730KL	RES, 30.0 k, 1%, 0.05 W, 0201	201
R12	1	RC0201FR-075K76L	RES, 5.76 k, 1%, 0.05 W, 0201	201
R13	1	CRCW020110K0FKED	RES, 10.0 k, 1%, 0.05 W, 0201	201
R16	1	RC0201FR-0747K5L	RES, 47.5 k, 1%, 0.05 W, 0201	201
R18, R24, R25	3	RC0201FR-071KL	RES, 1.00 k, 1%, 0.05 W, 0201	201
R19, R23	2	CRCW02010000Z0ED	RES, 0, 5%, 0.05 W, 0201	201
R20	1	RC0201FR-0715KL	RES, 15.0 k, 1%, 0.05 W, 0201	201
R21	1	RC0201FR-078K06L	RES, 8.06 k, 1%, 0.05 W, 0201	201
T1	1	749020111A	2MM DOUBLE ROW FEMALE IDC ASSEMB	SME24
U1	1	DP83867ERGZR	Extended Temperature Gigabit Ethernet PHY with SGMII, RGZ0048B (VQFN-48)	RGZ0048B
U2	1	TPS62441WRQRR	2.7-V to 6-V Adjustable-Frequency Dual Step-Down Converter in QFN package	VQFN-HR14
Y1	1	830081609	25 MHz ±10ppm Crystal 8pF 200 Ohms 4-SMD, No Lead	SMT_CRYSTAL_1MM6_1MM2
Z1	1	SFP-RJ45 X0330	SFP RJ45 Housing	

5 Revision History

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

DATE	REVISION	NOTES
July 2023	*	Initial Release

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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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