



Modular FMC Adapter

Evaluation Board User Guide

FPGA-EB-02059-1.0

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
DP	DisplayPort
eDP	Embedded DisplayPort
FMC	FPGA Mezzanine Connector
GPIO	General Purpose Input/Output
I ² C	Inter-Integrated Circuit
LED	Light-Emitting Diode

1. Introduction

This document describes the Lattice Semiconductor Modular FMC Adapter and DisplayPort (DP)/Embedded DisplayPort (eDP) daughter cards. When connected to an FPGA development board, video data is processed through the combination and configuration of the following daughter cards:

- DisplayPort Receiver Daughter Card
- DisplayPort Transmitter Daughter Card
- Embedded DisplayPort Transmitter Daughter Card

This user guide includes the descriptions, complete sets of schematics, and bill of materials for Modular FMC Adapter and daughter cards.

The key features include:

- Output of data as DisplayPort or Embedded DisplayPort
- Output of data as DisplayPort or Embedded DisplayPort
- Configuration of the boards for DisplayPort in and DisplayPort out
- Configuration of the boards for DisplayPort in and Embedded DisplayPort out

Figure 1.1 and Figure 1.2 show the top and bottom views of the Modular FMC Adapter and its key components.

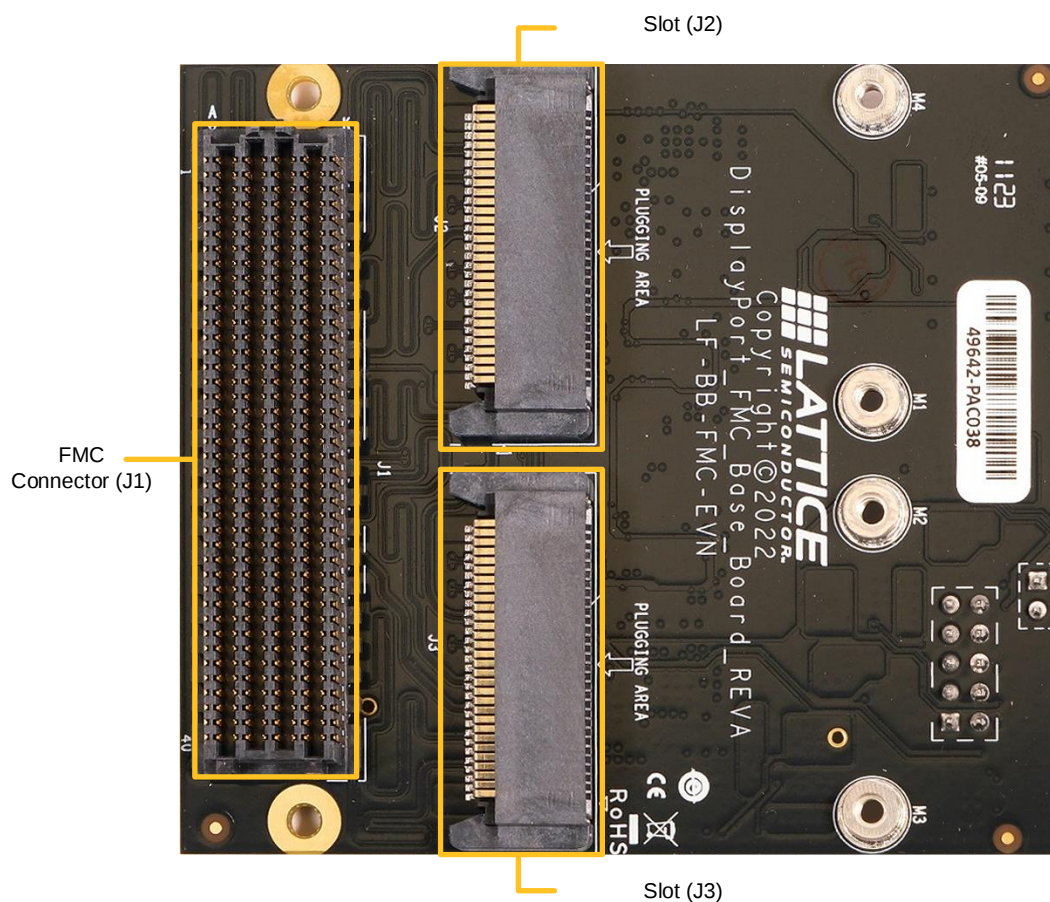


Figure 1.1. Modular FMC Adapter – Top View

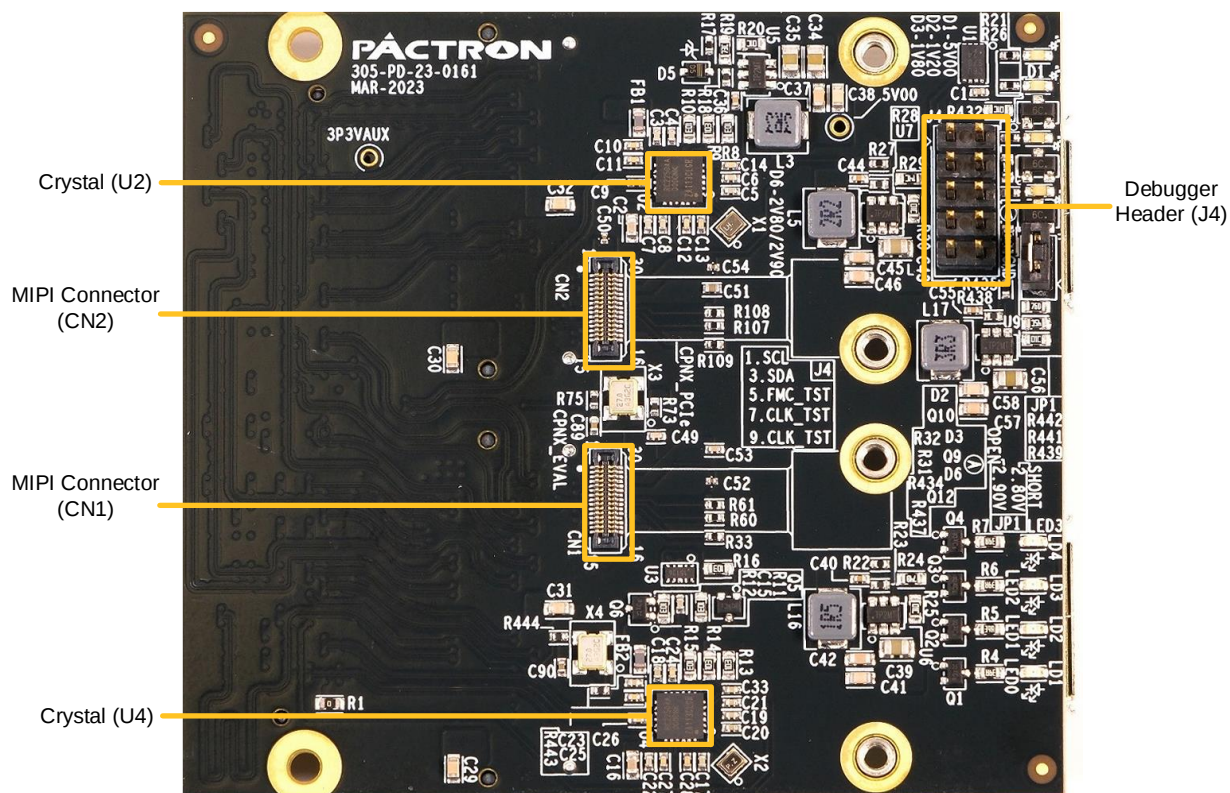


Figure 1.2. Modular FMC Adapter – Bottom View

2. Video In/Out Interface Support

The Modular FMC Adapter supports video in/out interfaces. This section describes the configuration options.

Figure 2.1 and Figure 2.2 show the block diagrams of the video in/out interfaces. Video data can be brought in and out of the FPGA through the different daughter card combinations.

Option 1: DisplayPort In and DisplayPort Out

As shown in Figure 2.1, DisplayPort video can be brought in through the DisplayPort Receiver Daughter Card by populating it to the J2 connector of the Modular FMC Adapter. The input signals are routed to the FPGA through the FMC connector (J1) and sent out through the DisplayPort Transmitter Daughter Card by populating it to the J3 connector of the Modular FMC Adapter.

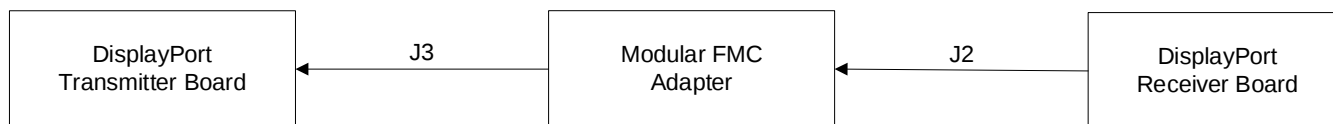


Figure 2.1. DisplayPort Video In and DisplayPort Video Out

Option 2: DisplayPort In and Embedded DisplayPort Out

As shown in Figure 2.2, DisplayPort video can be brought in through the DisplayPort Receiver Daughter Card by populating it to the J2 connector of the Modular FMC Adapter. The input signals are routed to the FPGA through the FMC connector (J1) and sent out through the Embedded DisplayPort Transmitter Daughter Card by populating it to the J3 connector of the Modular FMC Adapter.

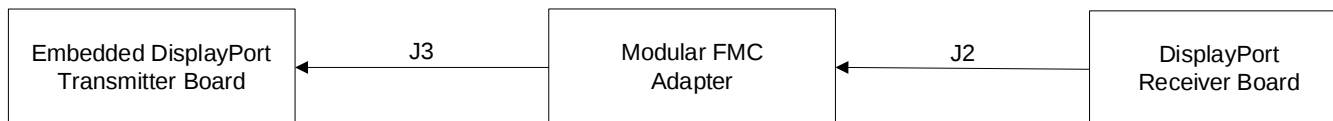


Figure 2.2. DisplayPort Video In and Embedded DisplayPort Video Out

3. Power Supply

The Modular FMC Adapter power is provided from the FMC connector (J1). The 12 V and 3.3 V rails are supplied to the board through the FMC connector. The 12 V supply is used to generate the 5.00 V power rail and the 5.00 V supply is used to generate the 2.80 V/2.90 V, 1.80 V, and 1.20 V power supplies.

Table 3.1 lists the board voltage rails, including the rail source voltage, voltage on net, and associated LEDs.

Table 3.1. Device Power Rail Summary

Voltage Rail	Source Rail	Voltage on Net (V)	Status LED	LED Color
12V	FMC Connector	12.00	N/A	N/A
5V0	12V	5.00	D1	Green
3V3	FMC Connector	3.30	N/A	N/A
M2P8	5V0	2.80 or 2.90 ⁽¹⁾	D6	Green
M1P8	5V0	1.80	D3	Green
M1P2	5V0	1.20	D2	Green

Notes:

1. 2.80 V or 2.90 V output selected through JP1

4. LED Indicators

The LED status indicators on the Modular FMC Adapter show the application status. Table 4.1 lists the status LED I/O map.

Table 4.1. Status LED I/O Map

Net Name	LED	Connector Pin	Color	Notes
N/A	D1	N/A	Green	5.0 V Status
N/A	D2	N/A	Green	1.2 V Status
N/A	D3	N/A	Green	1.8 V Status
N/A	D6	N/A	Green	2.8 V or 2.9 V Status
LED0	LD1	J1B.D8	Green	FPGA GPIO Control
LED1	LD2	J1B.D9	Green	FPGA GPIO Control
LED2	LD3	J1B.C10	Green	FPGA GPIO Control
LED3	LD4	J1B.C11	Green	FPGA GPIO Control

5. Headers, Jumpers, and Connectors

Table 5.1 lists the headers and jumpers that are shown in Figure 1.1 and Figure 1.2.

Table 5.1. Headers and Test Connectors

Part	Description	Settings
J1	FMC Connector	Connect to CertusPro-NX Evaluation Board or to <i>CertusPro-NX PCIe Bridge Board</i> ¹
J2	Daughter Card Connector	Connect DisplayPort Receiver Daughter Card
J3	Daughter Card Connector	Connect DisplayPort Transmitter Daughter Card or Embedded DisplayPort Transmitter Daughter Card
J4	Debug Header	—

Note:

1. The *CertusPro-NX PCIe Bridge Board* is not yet supported as indicated in [Known Limitation](#).

Table 5.2 to Table 5.5 list and describe the connector pins.

Table 5.2. FMC Connector Description

Pin	Pin Name	Net Connection
A1	GND	GND
A2	DP1_M2C_P	GT_RX0_P
A3	DP1_M2C_N	GT_RX0_N
A4	GND	GND
A5	GND	GND
A6	DP2_M2C_P	GT_RX2_P
A7	DP2_M2C_N	GT_RX2_N
A8	GND	GND
A9	GND	GND
A10	DP3_M2C_P	GT_RX3_P
A11	DP3_M2C_N	GT_RX3_N
A12	GND	GND
A13	GND	GND
A14	DP4_M2C_P	GT_RX5_P
A15	DP4_M2C_N	GT_RX5_N
A16	GND	GND
A17	GND	GND
A18	DP5_M2C_P	GT_RX7_P
A19	DP5_M2C_N	GT_RX7_N
A20	GND	GND
A21	GND	GND
A22	DP1_C2M_P	GT_TX0_P
A23	DP1_C2M_N	GT_TX0_N
A24	GND	GND
A25	GND	GND
A26	DP2_C2M_P	GT_TX2_P
A27	DP2_C2M_N	GT_TX2_N
A28	GND	GND
A29	GND	GND
A30	DP3_C2M_P	GT_TX3_P
A31	DP3_C2M_N	GT_TX3_N
A32	GND	GND
A33	GND	GND

Pin	Pin Name	Net Connection
A34	DP4_C2M_P	GT_TX5_P
A35	DP4_C2M_N	GT_TX5_N
A36	GND	GND
A37	GND	GND
A38	DP5_C2M_P	GT_TX7_P
A39	DP5_C2M_N	GT_TX7_N
A40	GND	GND
B1	RES1	No Connect
B2	GND	GND
B3	GND	GND
B4	DP9_M2C_P	No Connect
B5	DP9_M2C_N	No Connect
B6	GND	GND
B7	GND	GND
B8	DP8_M2C_P	No Connect
B9	DP8_M2C_N	No Connect
B10	GND	GND
B11	GND	GND
B12	DP7_M2C_P	GT_RX4_P
B13	DP7_M2C_N	GT_RX4_N
B14	GND	GND
B15	GND	GND
B16	DP6_M2C_P	GT_RX6_P
B17	DP6_M2C_N	GT_RX6_N
B18	GND	GND
B19	GND	GND
B20	GBTCLK1_M2C_P	GT_CLK1_P
B21	GBTCLK1_M2C_N	GT_CLK1_N
B22	GND	GND
B23	GND	GND
B24	DP9_C2M_P	No Connect
B25	DP9_C2M_N	No Connect
B26	GND	GND
B27	GND	GND
B28	DP8_C2M_P	No Connect
B29	DP8_C2M_N	No Connect
B30	GND	GND
B31	GND	GND
B32	DP7_C2M_P	GT_TX4_P
B33	DP7_C2M_N	GT_TX4_N
B34	GND	GND
B35	GND	GND
B36	DP6_C2M_P	GT_TX6_P
B37	DP6_C2M_N	GT_TX6_N
B38	GND	GND
B39	GND	GND
B40	RES0	No Connect
C1	GND	GND

Pin	Pin Name	Net Connection
C2	DP0_C2M_P	GT_TX1_P
C3	DP0_C2M_N	GT_TX1_N
C4	GND	GND
C5	GND	GND
C6	DP0_M2C_P	GT_RX1_P
C7	DP0_M2C_N	GT_RX1_N
C8	GND	GND
C9	GND	GND
C10	LA06_P	LED2
C11	LA06_N	LED3
C12	GND	GND
C13	GND	GND
C14	LA10_P	VID_CLK_LOCK
C15	LA10_N	No Connect
C16	GND	GND
C17	GND	GND
C18	LA14_P	CAMB_OP
C19	LA14_N	CAMB_ON
C20	GND	GND
C21	GND	GND
C22	LA18_P_CC	CAMB_CLKP
C23	LA18_N_CC	CAMB_CLKN
C24	GND	GND
C25	GND	GND
C26	LA27_P	CAMB_MCLK
C27	LA27_N	CAMB_FRAME_SYNC
C28	GND	GND
C29	GND	GND
C30	SCL	I2C_SCL
C31	SDA	I2C_SDA
C32	GND	GND
C33	GND	GND
C34	GA0	No Connect
C35	12P0V	12V
C36	GND	GND
C37	12P0V	12V
C38	GND	GND
C39	3P3V	3V3
C40	GND	GND
D1	PG_C2M	No Connect
D2	GND	GND
D3	GND	GND
D4	GBTCLK0_M2C_P	GT_CLK0_P
D5	GBTCLK0_M2C_N	GT_CLK0_N
D6	GND	GND
D7	GND	GND
D8	LA01_P_CC	LED0
D9	LA01_N_CC	LED1

Pin	Pin Name	Net Connection
D10	GND	GND
D11	LA05_P	GT_CLK_LOCK
D12	LA05_N	No Connect
D13	GND	GND
D14	LA09_P	CAMB_1P
D15	LA09_N	CAMB_1N
D16	GND	GND
D17	LA13_P	CAMB_2P
D18	LA13_N	CAMB_2N
D19	GND	GND
D20	LA17_P_CC	FMC_TST
D21	LA17_N_CC	No Connect
D22	GND	GND
D23	LA23_P	No Connect
D24	LA23_N	No Connect
D25	GND	GND
D26	LA26_P	I2C_SEL
D27	LA26_N	No Connect
D28	GND	GND
D29	TCK	No Connect
D30	TDI	TDO
D31	TDO	TDI
D32	3P3VAUX	Test Point
D33	TMS	No Connect
D34	TRST_L	No Connect
D35	GA1	No Connect
D36	3P3V	3V3
D37	GND	GND
D38	3P3V	3V3
D39	GND	GND
D40	3P3V	3V3
E1	GND	GND
E2	HA01_P_CC	CAME_CLKP
E3	HA01_N_CC	CAME_CLKN
E4	GND	GND
E5	GND	GND
E6	HA05_P	CAME_0P
E7	HA05_N	CAME_0N
E8	GND	GND
E9	HA09_P	CAME_1P
E10	HA09_N	CAME_1N
E11	GND	GND
E12	HA13_P	CAME_2P
E13	HA13_N	CAME_2N
E14	GND	GND
E15	HA16_P	CAME_3P
E16	HA16_N	CAME_3N
E17	GND	GND

Pin	Pin Name	Net Connection
E18	HA20_P	No Connect
E19	HA20_N	No Connect
E20	GND	GND
E21	HB03_P	No Connect
E22	HB03_N	No Connect
E23	GND	GND
E24	HB05_P	No Connect
E25	HB05_N	No Connect
E26	GND	GND
E27	HB09_P	No Connect
E28	HB09_N	No Connect
E29	GND	GND
E30	HB13_P	No Connect
E31	HB13_N	No Connect
E32	GND	GND
E33	HB19_P	No Connect
E34	HB19_N	No Connect
E35	GND	GND
E36	HB21_P	No Connect
E37	HB21_N	No Connect
E38	GND	GND
E39	VADJ	1V8
E40	GND	GND
F1	PG_M2C	No Connect
F2	GND	GND
F3	GND	GND
F4	HA00_P_CC	No Connect
F5	HA00_N_CC	No Connect
F6	GND	GND
F7	HA04_P	No Connect
F8	HA04_N	No Connect
F9	GND	GND
F10	HA08_P	No Connect
F11	HA08_N	No Connect
F12	GND	GND
F13	HA12_P	No Connect
F14	HA12_N	No Connect
F15	GND	GND
F16	HA15_P	No Connect
F17	HA15_N	No Connect
F18	GND	GND
F19	HA19_P	No Connect
F20	HA19_N	No Connect
F21	GND	GND
F22	HB02_P	No Connect
F23	HB02_N	No Connect
F24	GND	GND
F25	HB04_P	No Connect

Pin	Pin Name	Net Connection
F26	HB04_N	No Connect
F27	GND	GND
F28	HB08_P	No Connect
F29	HB08_N	No Connect
F30	GND	GND
F31	HB12_P	No Connect
F32	HB12_N	No Connect
F33	GND	GND
F34	HB16_P	No Connect
F35	HB16_N	No Connect
F36	GND	GND
F37	HB20_P	No Connect
F38	HB20_N	No Connect
F39	GND	GND
F40	VADJ	1V8
G1	GND	GND
G2	CLK1_M2C_P	VID_CLK0_P
G3	CLK1_M2C_N	VID_CLK0_N
G4	GND	GND
G5	GND	GND
G6	LA00_P_CC	VID_CLK_REF
G7	LA00_N_CC	27B
G8	GND	GND
G9	LA03_P	MZ0_IO6_P
G10	LA03_N	MZ0_IO6_N
G11	GND	GND
G12	LA08_P	CAMB_3P
G13	LA08_N	CAMB_3N
G14	GND	GND
G15	LA12_P	MZ0_IO4_P
G16	LA12_N	MZ0_IO4_N
G17	GND	GND
G18	LA16_P	CAMB_RESET
G19	LA12_N	MZ0_IO4_P
G20	GND	GND
G21	LA20_P	MZ0_IO2_P
G22	LA20_N	MZ0_IO2_N
G23	GND	GND
G24	LA22_P	MZ0_IO1_P
G25	LA22_N	MZ0_IO1_N
G26	GND	GND
G27	LA25_P	MZ1_IO2_P
G28	LA25_N	MZ1_IO2_N
G29	GND	GND
G30	LA29_P	MZ1_IO6_P
G31	LA29_N	MZ1_IO6_N
G32	GND	GND
G33	LA31_P	MZ1_IO4_P

Pin	Pin Name	Net Connection
G34	LA31_N	MZ1_IO4_N
G35	GND	GND
G36	LA33_P	MZ1_IO0_P
G37	LA33_N	MZ1_IO0_N
G38	GND	GND
G39	VADJ	1V8
G40	GND	GND
H1	VREF_A_M2C	No Connect
H2	PRSNT_M2C_L	GND
H3	GND	GND
H4	CLK0_M2C_P	VID_CLK1_P
H5	CLK0_M2C_N	VID_CLK1_N
H6	GND	GND
H7	LA02_P	MZ0_IO7_P
H8	LA02_N	MZ0_IO7_N
H9	GND	GND
H10	LA04_P	No Connect
H11	LA04_N	No Connect
H12	GND	GND
H13	LA07_P	MZ0_IO5_P
H14	LA07_N	MZ0_IO5_N
H15	GND	GND
H16	LA11_P	No Connect
H17	LA11_N	No Connect
H18	GND	GND
H19	LA15_P	MZ0_IO3_N
H20	LA15_N	MZ0_IO3_P
H21	GND	GND
H22	LA19_P	CAMB_SCL
H23	LA19_N	CAMB_SDA
H24	GND	GND
H25	LA21_P	MZ0_IO0_P
H26	LA21_N	MZ0_IO0_N
H27	GND	GND
H28	LA24_P	MZ1_IO7_P
H29	LA24_N	MZ1_IO7_N
H30	GND	GND
H31	LA28_P	MZ1_IO5_P
H32	LA28_N	MZ1_IO5_N
H33	GND	GND
H34	LA30_P	MZ1_IO3_P
H35	LA30_N	MZ1_IO3_N
H36	GND	GND
H37	LA32_P	MZ1_IO1_N
H38	LA32_N	MZ1_IO1_P
H39	GND	GND
H40	VADJ	1V8
J1	GND	GND

Pin	Pin Name	Net Connection
J2	CLK3_M2C_P	CAME_MCLK
J3	CLK3_M2C_N	CAME_FRAME_SYNC
J4	GND	GND
J5	GND	GND
J6	HA03_P	No Connect
J7	HA03_N	No Connect
J8	GND	GND
J9	HA07_P	No Connect
J10	HA07_N	No Connect
J11	GND	GND
J12	HA11_P	No Connect
J13	HA11_N	No Connect
J14	GND	GND
J15	HA14_P	No Connect
J16	HA14_N	No Connect
J17	GND	GND
J18	HA18_P	No Connect
J19	HA18_N	No Connect
J20	GND	GND
J21	HA22_P	CAME_RESET
J22	HA22_N	No Connect
J23	GND	GND
J24	HB01_P	No Connect
J25	HB01_N	No Connect
J26	GND	GND
J27	HB07_P	No Connect
J28	HB07_N	No Connect
J29	GND	GND
J30	HB11_P	No Connect
J31	HB11_N	No Connect
J32	GND	GND
J33	HB15_P	No Connect
J34	HB15_N	No Connect
J35	GND	GND
J36	HB18_P	No Connect
J37	HB18_N	No Connect
J38	GND	GND
J39	VIO_B_M2C-1	No Connect
J40	HB15_N	No Connect
K1	VREF_B_M2C	No Connect
K2	GND	GND
K3	GND	GND
K4	CLK2_M2C_P	No Connect
K5	CLK2_M2C_N	No Connect
K6	GND	GND
K7	HA02_P	No Connect
K8	HA02_N	No Connect
K9	GND	GND

Pin	Pin Name	Net Connection
K10	HA06_P	No Connect
K11	HA06_N	No Connect
K12	GND	GND
K13	HA10_P	No Connect
K14	HA10_N	No Connect
K15	GND	GND
K16	HA17_P_CC	27E
K17	HA17_N_CC	No Connect
K18	GND	GND
K19	HA21_P	No Connect
K20	HA21_N	No Connect
K21	GND	GND
K22	HA23_P	CAME_SCL
K23	HA23_N	CAME_SDA
K24	GND	GND
K25	HB00_P_CC	No Connect
K26	HB00_N_CC	No Connect
K27	GND	GND
K28	HB06_P_CC	No Connect
K29	HB06_N_CC	No Connect
K30	GND	GND
K31	HB10_P	No Connect
K32	HB10_N	No Connect
K33	GND	GND
K34	HB14_P	No Connect
K35	HB14_N	No Connect
K36	GND	GND
K37	HB17_P_CC	No Connect
K38	HB17_N_CC	No Connect
K39	GND	GND
K40	VIO_B_M2C-2	No Connect

Table 5.3. Daughter Card (Receiver) Connector Description

Pin	Pin Name	Net Connection
1	IO0-	MZ0_IO0_N
2	+12V14	12V
3	IO0+	MZ0_IO0_P
4	+12V	12V
5	GND	GND
6	GND15	GND
7	IO1-	MZ0_IO1_N
8	GT_TX3-	GT_TX7_N
9	IO1+	MZ0_IO1_P
10	GT_TX3+	GT_TX7_P
11	IO2-	MZ0_IO2_N
12	GND18	GND
13	IO2+	MZ0_IO2_P
14	GT_TX2-	GT_TX6_N
15	IO3-	MZ0_IO3_N
16	GT_TX2+	GT_TX6_P
17	IO3+	MZ0_IO3_P
18	GND17	GND
19	IO4-	MZ0_IO4_N
20	GT_TX1-	GT_TX5_N
21	IO4+	MZ0_IO4_P
22	GT_TX1+	GT_TX5_P
23	IO5-	MZ0_IO5_N
24	GND16	GND
25	IO5+	MZ0_IO5_P
26	GT_TX0-	GT_TX4_N
27	VREF	1V8
28	GT_TX0+	GT_TX4_P
29	GND6	GND
30	GND13	GND
31	GND1	GND
32	GND12	GND
33	VREF2	1V8
34	GT_RX3-	GT_RX3_N
35	IO6-	MZ0_IO6_N
36	GT_RX3+	GT_RX3_P
37	IO6+	MZ0_IO6_P
38	GND9	GND
39	IO7-	MZ0_IO7_N
40	GT_RX2-	GT_RX2_N
41	IO7+	MZ0_IO7_P
42	GT_RX2+	GT_RX2_P
43	GND3	GND
44	GND8	GND
45	IOCLK-	No Connect
46	GT_RX1-	GT_RX1_N
47	IOCLK+	No Connect

Pin	Pin Name	Net Connection
48	GT_RX1+	GT_RX1_P
49	GND4	GND
50	GND7	GND
51	SDA	I2C_SDA
52	GT_RX0-	GT_RX0_N
53	SCL	I2C_SCL
54	GT_RX0+	GT_RX0_P
55	GND5	GND
56	GND10	GND
57	INT	No Connect
58	+3V311	3V3
59	ID	GND
60	+3V3	3V3

Table 5.4. Daughter Card (Transmitter) Connector Description

Pin	Pin Name	Net Connection
1	IO0-	MZ0_IO0_N
2	+12V14	12V
3	IO0+	MZ0_IO0_P
4	+12V	12V
5	GND	GND
6	GND15	GND
7	IO1-	MZ0_IO1_N
8	GT_TX3-	GT_TX7_N
9	IO1+	MZ0_IO1_P
10	GT_TX3+	GT_TX7_P
11	IO2-	MZ0_IO2_N
12	GND18	GND
13	IO2+	MZ0_IO2_P
14	GT_TX2-	GT_TX6_N
15	IO3-	MZ0_IO3_N
16	GT_TX2+	GT_TX6_P
17	IO3+	MZ0_IO3_P
18	GND17	GND
19	IO4-	MZ0_IO4_N
20	GT_TX1-	GT_TX5_N
21	IO4+	MZ0_IO4_P
22	GT_TX1+	GT_TX5_P
23	IO5-	MZ0_IO5_N
24	GND16	GND
25	IO5+	MZ0_IO5_P
26	GT_TX0-	GT_TX4_N
27	VREF	1V8
28	GT_TX0+	GT_TX4_P
29	GND6	GND
30	GND13	GND
31	GND1	GND
32	GND12	GND
33	VREF2	1V8
34	GT_RX3-	GT_RX3_N
35	IO6-	MZ0_IO6_N
36	GT_RX3+	GT_RX3_P
37	IO6+	MZ0_IO6_P
38	GND9	GND
39	IO7-	MZ0_IO7_N
40	GT_RX2-	GT_RX2_N
41	IO7+	MZ0_IO7_P
42	GT_RX2+	GT_RX2_P
43	GND3	GND
44	GND8	GND
45	IOCLK-	No Connect
46	GT_RX1-	GT_RX1_N
47	IOCLK+	No Connect

Pin	Pin Name	Net Connection
48	GT_RX1+	GT_RX1_P
49	GND4	GND
50	GND7	GND
51	SDA	I2C_SDA
52	GT_RX0-	GT_RX0_N
53	SCL	I2C_SCL
54	GT_RX0+	GT_RX0_P
55	GND5	GND
56	GND10	GND
57	INT	No Connect
58	+3V311	3V3
59	ID	GND
60	+3V3	3V3

Table 5.5. Debug Header Connector Description

Pin	Net Connection
1	I2C_SCL
2	GND
3	I2C_SDA
4	GND
5	FMC_TST
6	GND
7	VID_CLK_TST
8	GND
9	GT_CLK_TST
10	GND

6. DisplayPort Receiver Daughter Card

The DisplayPort Receiver Daughter Card connects to the Modular FMC Adapter through the J2 connector. A DisplayPort source connects to the Daughter Card through the J1 DisplayPort connector.

Figure 6.1 and Figure 6.2 show the top and bottom views of the DisplayPort Receiver Daughter Card and its key components.

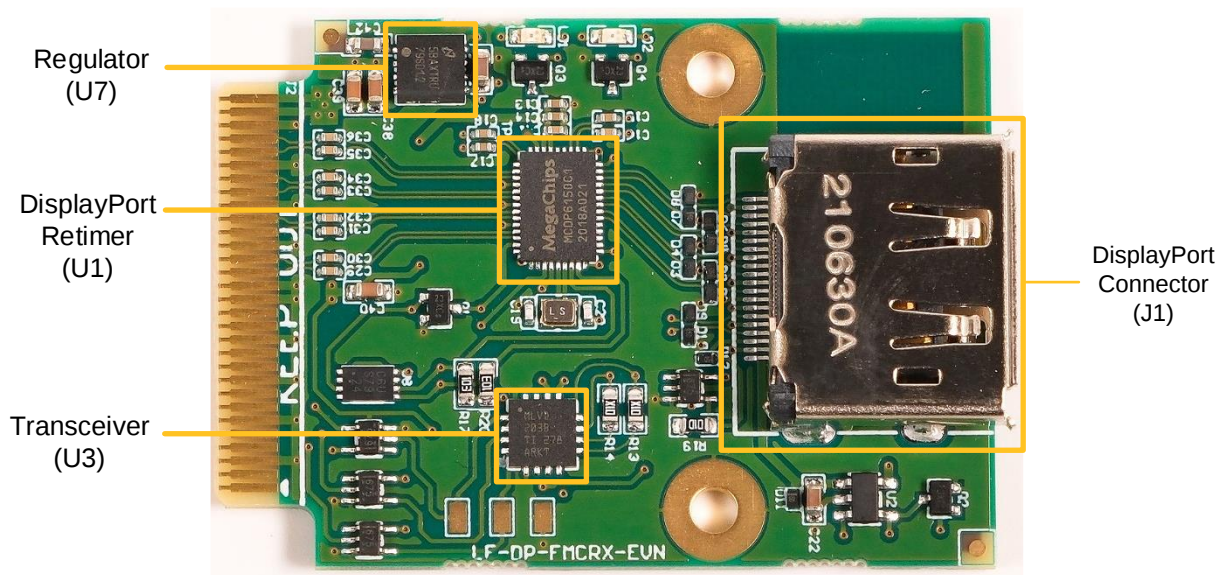


Figure 6.1. DisplayPort Receiver Daughter Card – Top View

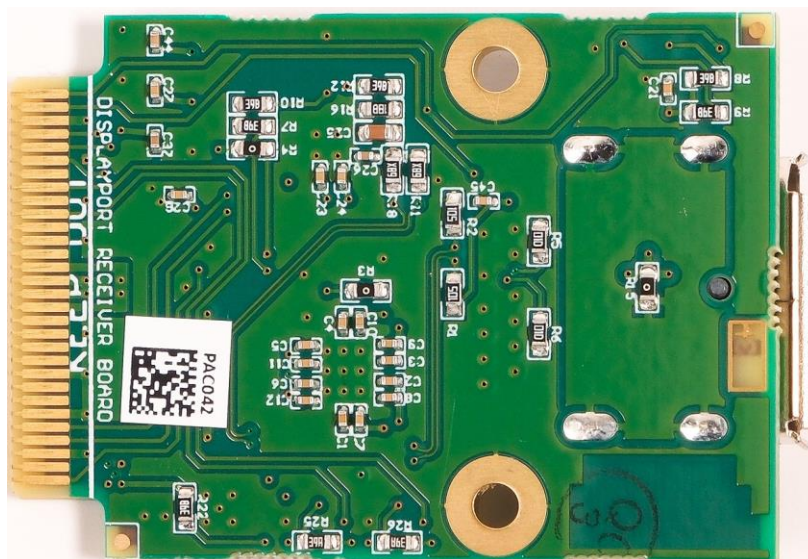


Figure 6.2. DisplayPort Receiver Daughter Card – Bottom View

6.1. Jumpers and Connectors

Table 6.1. Connectors

Part	Description
J1	DisplayPort Connector
J2	Modular FMC Adapter Mating Connector

Table 6.2 and Table 6.3 list and describe the connector pins.

Table 6.2. DisplayPort Connector Description

Pin	Name	Net Connection
1	ML_LANE3-	DP_ML3_N
2	GND3	GND
3	ML_LANE3+	DP_ML3_P
4	ML_LANE2-	DP_ML2_N
5	GND2	GND
6	ML_LANE2+	DP_ML2_P
7	ML_LANE1-	DP_ML1_N
8	GND1	GND
9	ML_LANE1+	DP_ML1_P
10	ML_LANE0-	DP_ML0_N
11	GND	GND
12	ML_LANE0+	DP_ML0_P
13	CONFIG1	GND
14	CONFIG2	GND
15	AUX_CH+	DP_AUX_P
16	GND4	GND
17	AUX_CH-	DP_AUX_N
18	HPD	DP_HPD
19	GND5	GND
20	DP_PWR	DP_PWR

Table 6.3. Modular FMC Adapter Mating Connector Description

Pin	Name	Net Connection
1	IO0-	PWR_EN
2	+12V14	TP3
3	IO0+	MZ_HPD
4	+12V	TP4
5	GND	GND
6	GND15	GND
7	IO1-	MZ_AUX_TX
8	GT_TX3-	No Connect
9	IO1+	MZ_AUX_OE
10	GT_TX3+	No Connect
11	IO2-	MZ_AUX_RX
12	GND18	GND
13	IO2+	No Connect
14	GT_TX2-	No Connect
15	IO3-	LED1

Pin	Name	Net Connection
16	GT_TX2+	No Connect
17	IO3+	No Connect
18	GND17	GND
19	IO4-	LED0
20	GT_TX1-	No Connect
21	IO4+	No Connect
22	GT_TX1+	No Connect
23	IO5-	No Connect
24	GND16	GND
25	IO5+	No Connect
26	GT_TX0-	No Connect
27	VREF	1V8
28	GT_TX0+	No Connect
29	GND6	GND
30	GND13	GND
31	GND1	GND
32	GND12	GND
33	VREF2	1V8
34	GT_RX3-	MZ_ML0_P
35	IO6-	No Connect
36	GT_RX3+	MZ_ML0_N
37	IO6+	No Connect
38	GND9	GND
39	IO7-	No Connect
40	GT_RX2-	MZ_ML1_P
41	IO7+	No Connect
42	GT_RX2+	MZ_ML1_N
43	GND3	GND
44	GND8	GND
45	IOCLK-	No Connect
46	GT_RX1-	MZ_ML2_P
47	IOCLK+	No Connect
48	GT_RX1+	MZ_ML2_N
49	GND4	GND
50	GND7	GND
51	SDA	I2C_SDA
52	GT_RX0-	MZ_ML3_P
53	SCL	I2C_SCL
54	GT_RX0+	MZ_ML3_N
55	GND5	GND
56	GND10	GND
57	INT	No Connect
58	+3V311	3V3
59	ID	ID
60	+3V3	3V3

7. DisplayPort Transmitter Daughter Card

The DisplayPort Transmitter Daughter Card connects to the Modular FMC Adapter through the J3 connector. A DisplayPort sink is connected to the Daughter Card through the J2 DisplayPort connector.

Figure 7.1 and Figure 7.2 show the top and bottom views of the DisplayPort Transmitter Daughter Card and its key components.

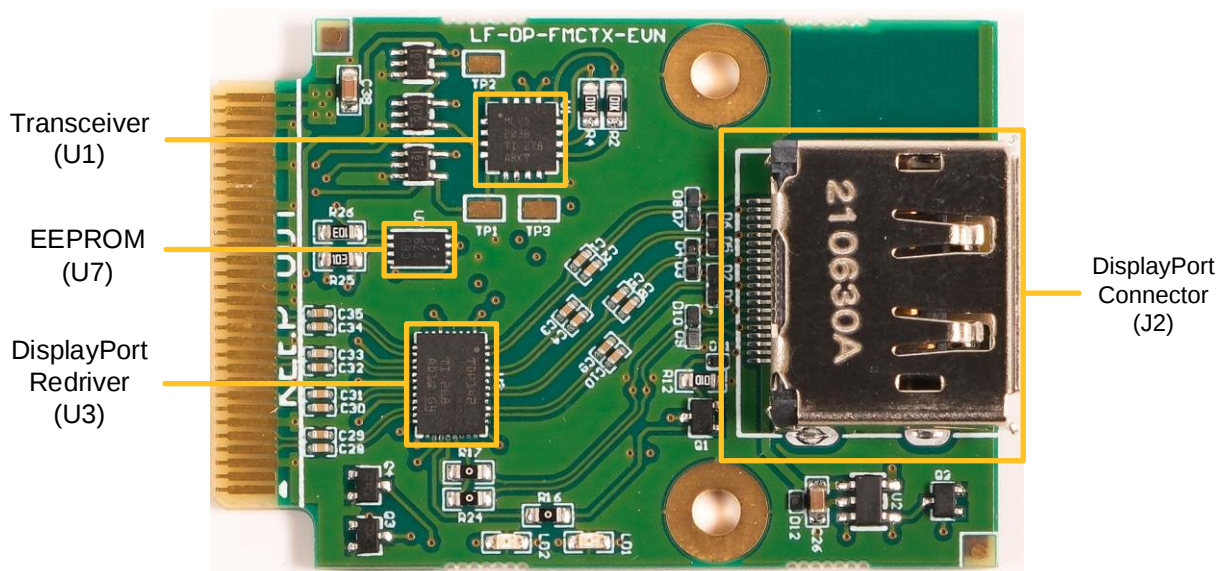


Figure 7.1. DisplayPort Transmitter Daughter Card – Top View

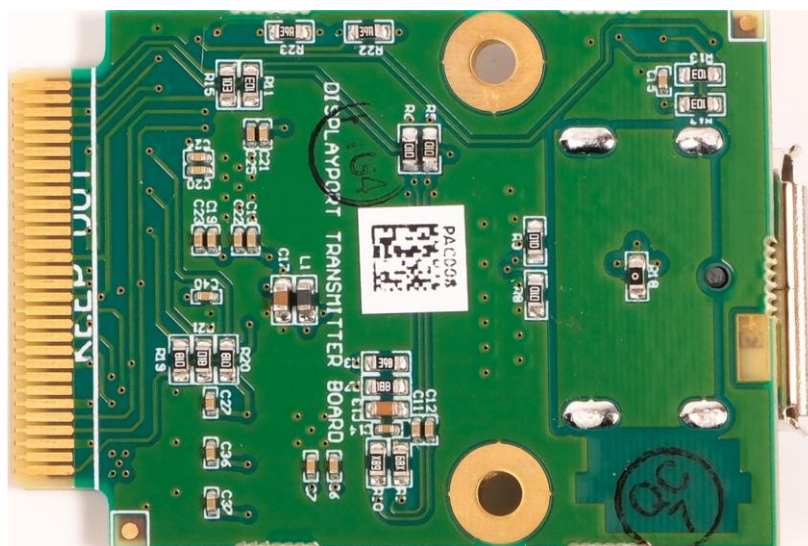


Figure 7.2. DisplayPort Transmitter Daughter Card – Bottom View

7.1. Jumpers and Connectors

Table 7.1. Connectors

Part	Description
J1	Modular FMC Adapter Mating Connector
J2	DisplayPort Connector

Table 7.2 and Table 7.3 list and describe the connector pins.

Table 7.2. Modular FMC Adapter Mating Connector Description

Pin	Name	Net Connection
1	IO0-	PWR_EN
2	+12V14	TP4
3	IO0+	MZ_HPDP
4	+12V	TP5
5	GND	GND
6	GND15	GND
7	IO1-	LED0
8	GT_TX3-	MZ_ML0_P
9	IO1+	LED1
10	GT_TX3+	MZ_ML0_N
11	IO2-	No Connect
12	GND18	GND
13	IO2+	No Connect
14	GT_TX2-	MZ_ML1_P
15	IO3-	No Connect
16	GT_TX2+	MZ_ML1_N
17	IO3+	No Connect
18	GND17	GND
19	IO4-	No Connect
20	GT_TX1-	MZ_ML2_P
21	IO4+	No Connect
22	GT_TX1+	MZ_ML2_N
23	IO5-	No Connect
24	GND16	GND
25	IO5+	No Connect
26	GT_TX0-	MZ_ML3_P
27	VREF	1V8
28	GT_TX0+	MZ_ML3_N
29	GND6	GND
30	GND13	GND
31	GND1	GND
32	GND12	GND
33	VREF2	1V8
34	GT_RX3-	No Connect
35	IO6-	No Connect
36	GT_RX3+	No Connect
37	IO6+	MZ_AUX_TX
38	GND9	GND

Pin	Name	Net Connection
39	IO7-	MZ_AUX_RX
40	GT_RX2-	No Connect
41	IO7+	MZ_AUX_OE
42	GT_RX2+	No Connect
43	GND3	GND
44	GND8	GND
45	IOCLK-	No Connect
46	GT_RX1-	No Connect
47	IOCLK+	No Connect
48	GT_RX1+	No Connect
49	GND4	GND
50	GND7	GND
51	SDA	I2C_SDA
52	GT_RX0-	No Connect
53	SCL	I2C_SCL
54	GT_RX0+	No Connect
55	GND5	GND
56	GND10	GND
57	INT	No Connect
58	+3V311	3V3
59	ID	ID
60	+3V3	3V3

Table 7.3. DisplayPort Connector Description

Pin	Name	Net Connection
1	ML_LANE3-	DP_ML3_N
2	GND3	GND
3	ML_LANE3+	DP_ML3_P
4	ML_LANE2-	DP_ML2_N
5	GND2	GND
6	ML_LANE2+	DP_ML2_P
7	ML_LANE1-	DP_ML1_N
8	GND1	GND
9	ML_LANE1+	DP_ML1_P
10	ML_LANE0-	DP_ML0_N
11	GND	GND
12	ML_LANE0+	DP_ML0_P
13	CONFIG1	GND
14	CONFIG2	GND
15	AUX_CH+	DP_AUX_P
16	GND4	GND
17	AUX_CH-	DP_AUX_N
18	HPD	DP_HPD
19	GND5	GND
20	DP_PWR	DP_PWR

8. Embedded DisplayPort Transmitter Daughter Card

The DisplayPort Transmitter Daughter Card connects to the Modular FMC Adapter's J3 connector. A DisplayPort sink is connected to the daughter card through the J2 DisplayPort connector.

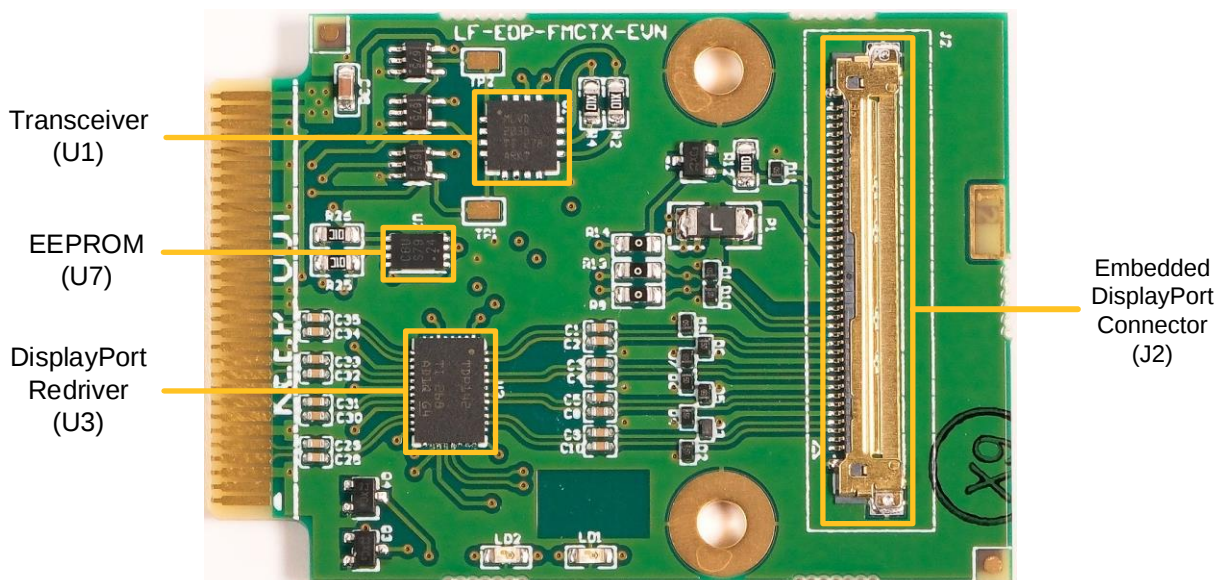


Figure 8.1. Top View of Embedded DisplayPort Transmitter Daughter Card

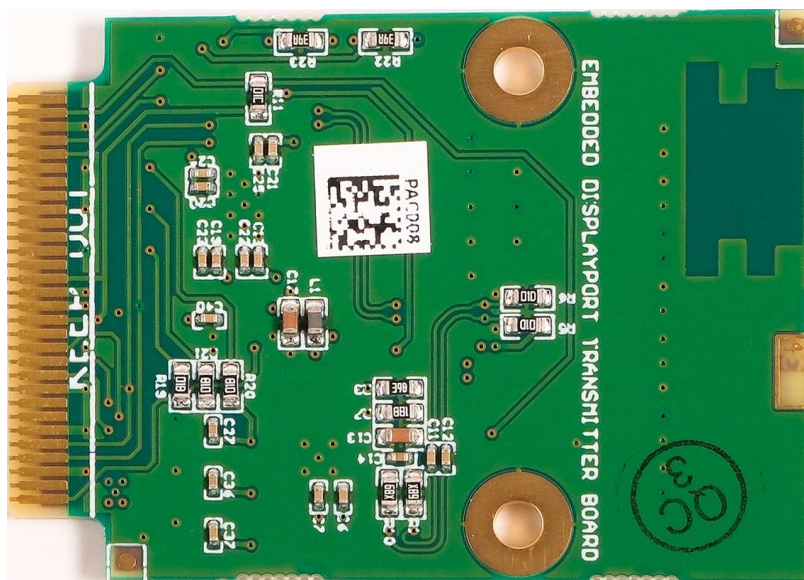


Figure 8.2. Bottom View of Embedded DisplayPort Transmitter Daughter Card

8.1. Jumpers and Connectors

Table 8.1. Connectors

Part	Description
J1	Modular FMC Adapter Mating Connector
J2	DisplayPort Connector

Table 8.2 and Table 8.3 list and describe the connector pins.

Table 8.2. Modular FMC Adapter Mating Connector Description

Pin	Name	Net Connection
1	IO0-	No Connect
2	+12V14	No Connect
3	IO0+	MZ_HPDP
4	+12V	No Connect
5	GND	GND
6	GND15	GND
7	IO1-	LED0
8	GT_TX3-	MZ_ML0_P
9	IO1+	LED1
10	GT_TX3+	MZ_ML0_N
11	IO2-	No Connect
12	GND18	GND
13	IO2+	No Connect
14	GT_TX2-	MZ_ML1_P
15	IO3-	No Connect
16	GT_TX2+	MZ_ML1_N
17	IO3+	No Connect
18	GND17	GND
19	IO4-	No Connect
20	GT_TX1-	MZ_ML2_P
21	IO4+	No Connect
22	GT_TX1+	MZ_ML2_N
23	IO5-	No Connect
24	GND16	GND
25	IO5+	No Connect
26	GT_TX0-	MZ_ML3_P
27	VREF	1V8
28	GT_TX0+	MZ_ML3_N
29	GND6	GND
30	GND13	GND
31	GND1	GND
32	GND12	GND
33	VREF2	1V8
34	GT_RX3-	No Connect
35	IO6-	No Connect
36	GT_RX3+	No Connect
37	IO6+	MZ_AUX_TX
38	GND9	GND

Pin	Name	Net Connection
39	IO7-	MZ_AUX_RX
40	GT_RX2-	No Connect
41	IO7+	MZ_AUX_OE
42	GT_RX2+	No Connect
43	GND3	GND
44	GND8	GND
45	IOCLK-	No Connect
46	GT_RX1-	No Connect
47	IOCLK+	No Connect
48	GT_RX1+	No Connect
49	GND4	GND
50	GND7	GND
51	SDA	I2C_SDA
52	GT_RX0-	No Connect
53	SCL	I2C_SCL
54	GT_RX0+	No Connect
55	GND5	GND
56	GND10	GND
57	INT	No Connect
58	+3V311	3V3
59	ID	ID
60	+3V3	3V3

Table 8.3. DisplayPort Connector Description

Pin	Name	Net Connection
1	NC	No Connect
2	GND	GND
3	ML3-	DP_ML3_N
4	ML3+	DP_ML3_P
5	GND1	GND
6	ML2-	DP_ML2_N
7	ML2+	DP_ML2_P
8	GND2	GND
9	ML1-	DP_ML1_N
10	ML1+	DP_ML1_P
11	GND3	GND
12	ML0-	DP_ML0_N
13	ML0+	DP_ML0_P
14	GND4	GND
15	AUX+	DP_AUX_P
16	AUX-	DP_AUX_N
17	GND5	GND
18	3V3	3V3
19	3V3_1	3V3
20	3V3_2	3V3
21	3V3_3	3V3
22	NC1	No Connect
23	GND6	GND
24	GND7	GND
25	GND8	GND
26	GND9	GND
27	HPD	DP_HPD
28	NC2	No Connect
29	NC3	No Connect
30	NC4	No Connect
31	NC5	No Connect
32	NC6	No Connect
33	NC7	No Connect
34	NC8	No Connect
35	NC9	No Connect
36	NC10	No Connect
37	NC11	No Connect
38	NC12	No Connect
39	NC13	No Connect
40	NC14	No Connect

9. Ordering Information

The part numbers in Table 9.1 is for reference only, so it is clear which board is described in this document. Visit www.latticesemi.com/boards for the latest ordering information.

Table 9.1. Reference Part Number

Description	Ordering Part Number
Modular FMC Adapter	LF-BB-FMC-EVN
DisplayPort Receiver Daughter Card	LF-DP-FMCRX-EVN
DisplayPort Transmitter Daughter Card	LF-DP-FMCTX-EVN
Embedded DisplayPort Transmitter Daughter Card	LF-EDP-FMCTX-EVN

10. Known Limitation

- The CertusPro-NX PCIe Bridge Board is not yet supported by the boards.
- The daughter cards may work with other boards with FMC connectors. However, at the time of this writing, the mapping has only been verified on the CertusPro-NX Evaluation Board and CertusPro-NX PCIe Bridge Board.
- MIPI connectors CN1 and CN2 are not yet recommended for use and are meant for a future release.

References

For more information, refer to the following:

- [CertusPro-NX Family Data Sheet \(FPGA-DS-02086\)](#)
- [CertusPro-NX Evaluation Board User Guide \(FPGA-EB-02046\)](#)
- [CertusPro-NX PCIe Bridge Board User Guide \(FPGA-EB-02056\)](#)
- [DisplayPort IP Core User Guide \(FPGA-IPUG-02236\)](#)
- [Video Scaler IP User Guide \(FPGA-IPUG-02234\)](#)
- [DisplayPort and Video Scaler Reference Design \(FPGA-RD-02276\)](#)
- [DisplayPort and Video Scaler Demo User Guide \(FPGA-UG-02191\)](#)
- [Lattice Development Kits and Boards - Modular FMC Adapter web page](#)
- [CertusPro-NX web page](#)
- [Lattice mVision™ solutions stack web page](#)
- [Lattice Drive™ solutions stack web page](#)
- [Video Scaler IP Core web page](#)
- [DisplayPort IP Core web page](#)
- [Parretto DisplayPort IP Core web page](#)
- [DisplayPort and Video Scaler Reference Design web page](#)
- [Lattice Insights](#) for Lattice Semiconductor training courses and learning plans

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

For frequently asked questions, refer to the Lattice Answer Database at <https://www.latticesemi.com/Support/AnswerDatabase>.

[illegible]

Figure A.1. Modular FMC Adapter Title Page

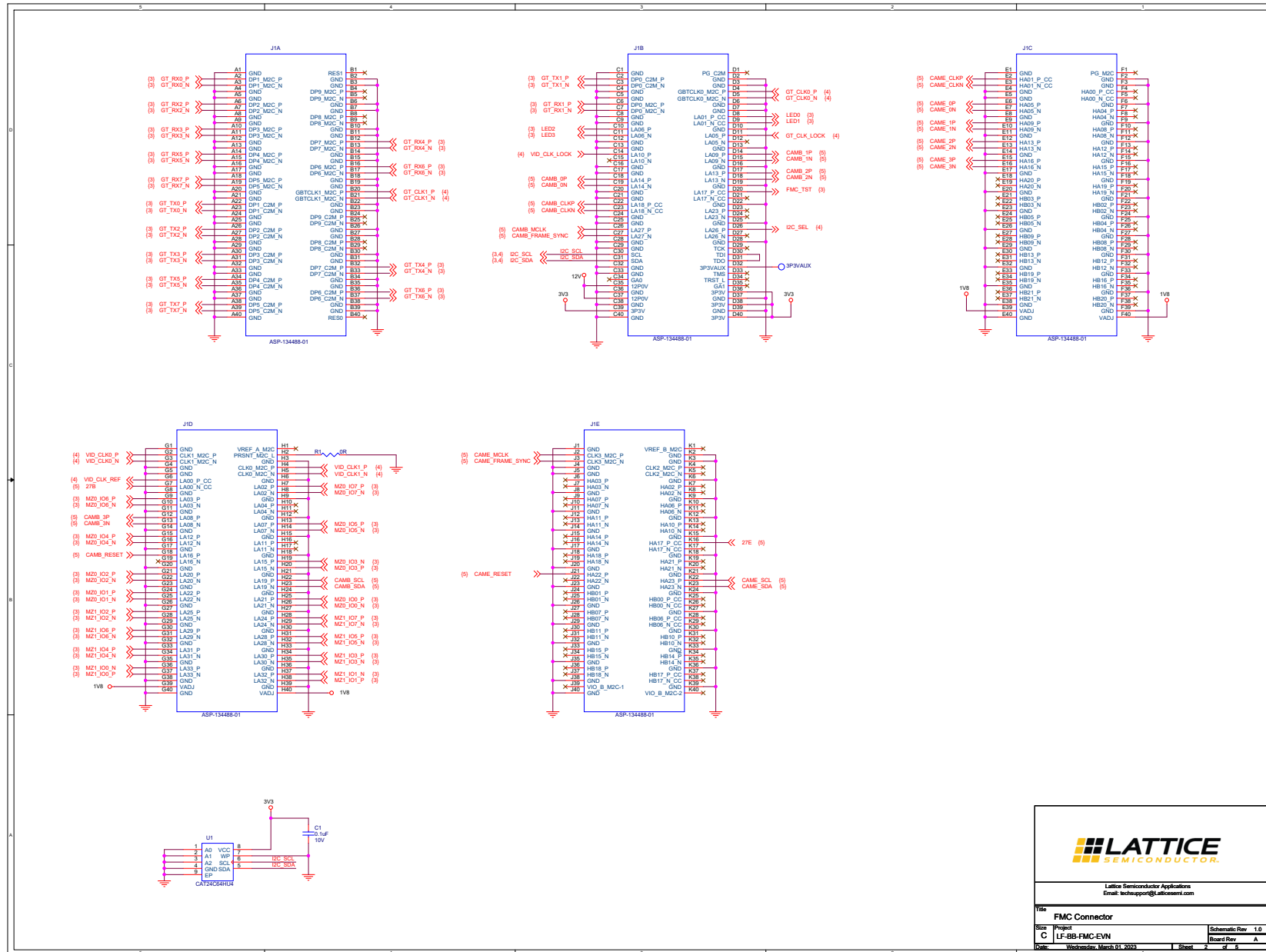


Figure A.2. FMC Connector

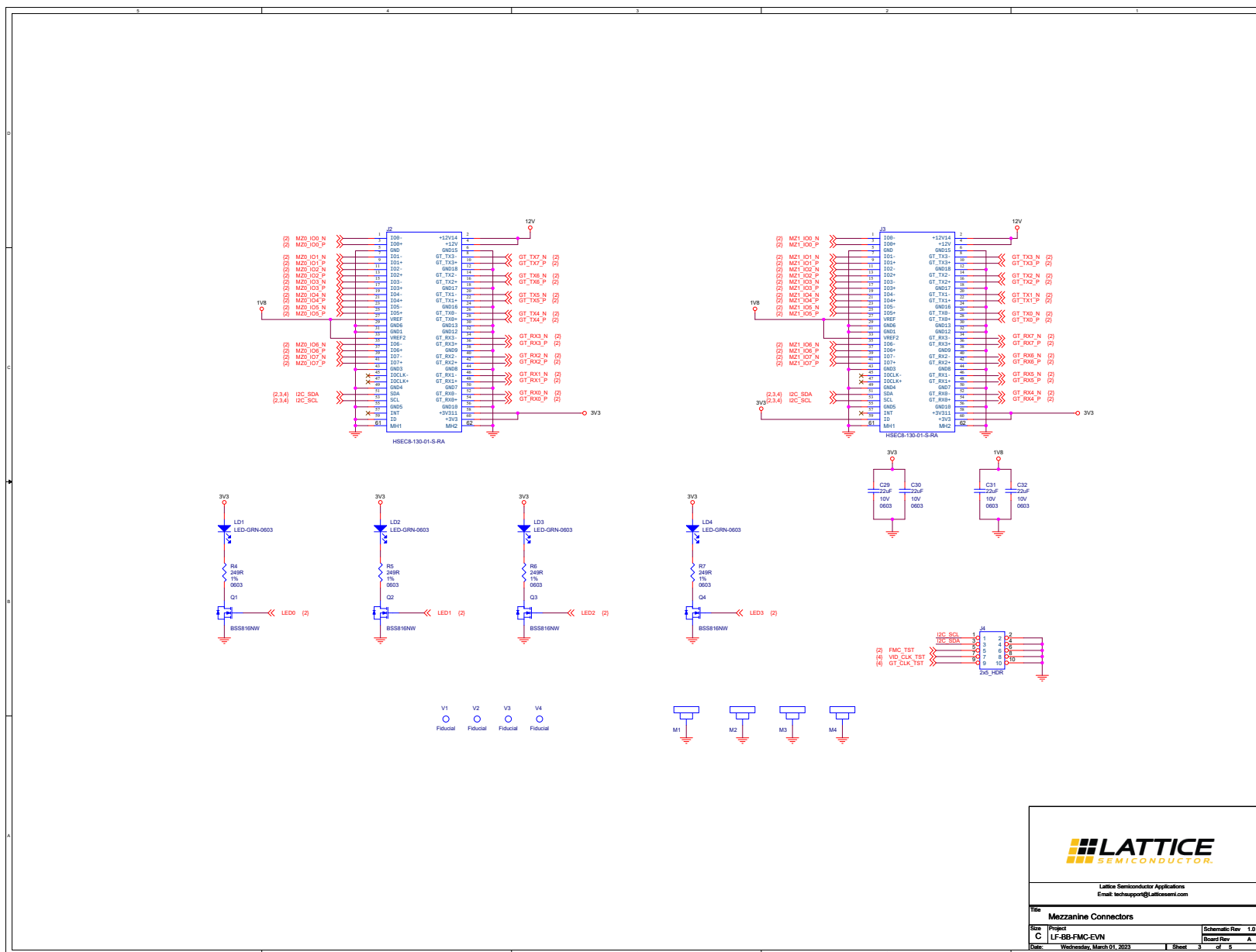
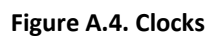


Figure A.3. Mezzanine Connectors



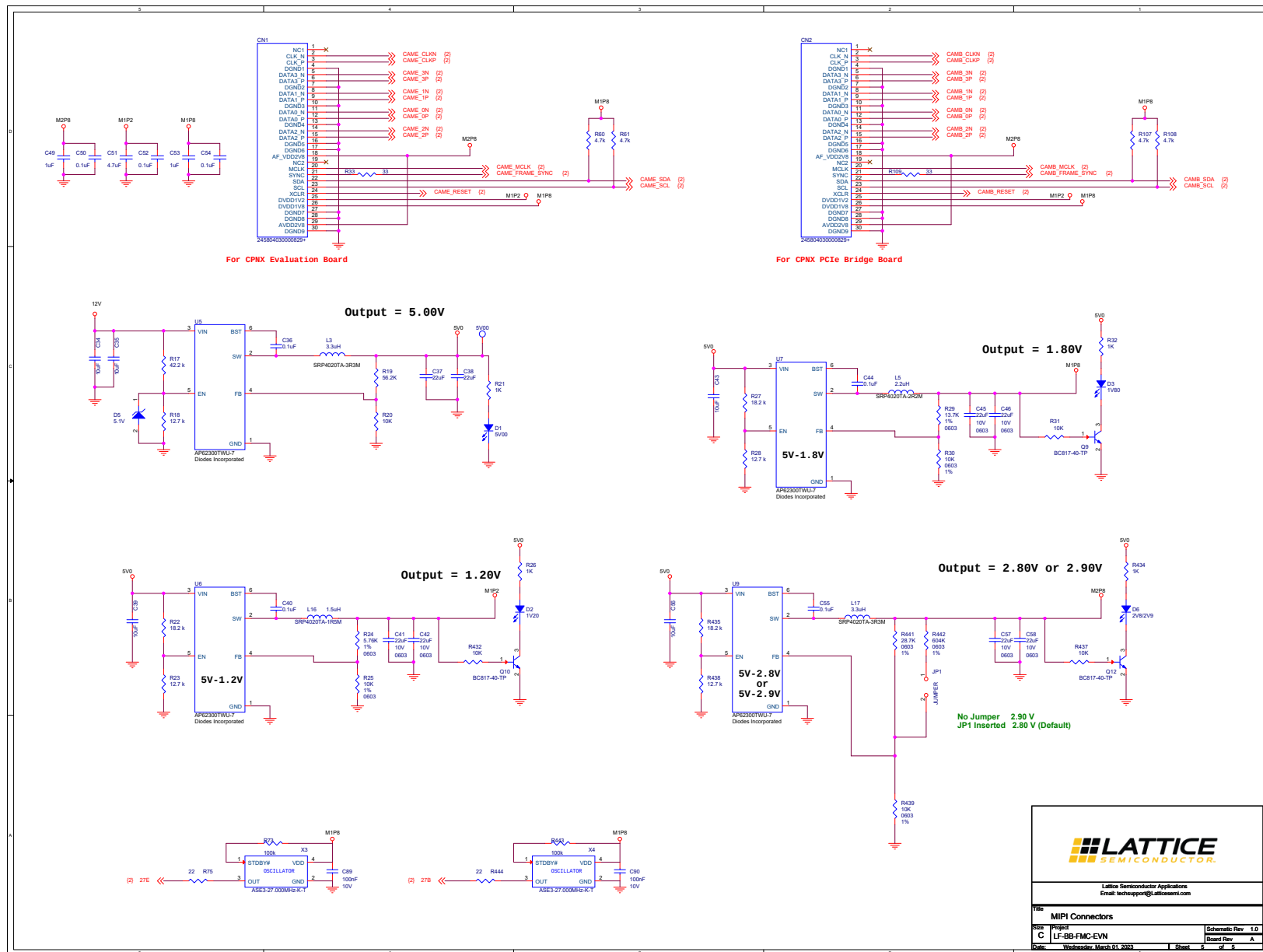


Figure A.5. MIPI Connectors

Appendix B – Modular FMC Adapter Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
1	CN1,CN2	2	245804030 000829+	camconn	-	2458040300008 29+	Kyocera International Inc. Electronic Components	CONN RCPT 30POS SMD
2	C1,C3,C4,C5,C6,C7,C8,C9,C15, C17,C18,C19,C20,C21,C22,C2 3,C33	17	0.1uF	C0402	-	GRM155R61A10 4KA01J	Murata Electronics	CAP CER 0.1UF 10V X5R 0402
3	C2,C16	2	4.7uF	C0603	-	GRM188Z71A47 5KE15D	Murata Electronics	CAP CER 4.7UF 10V X7R 0603
4	C10,C11,C12,C13,C14,C24,C2 5,C26,C27,C28	10	100pF	C0402	-	C0402C101K8R AC7867	KEMET	CAP CER 100PF 10V X7R 0402
5	C29,C30,C31,C32,C41,C42,C4 5,C46,C57,C58	10	22uF	C0603	-	CL10A226MP8N UNE	Samsung Electro- Mechanics	CAP CER 22UF 10V X5R 0603
6	C34,C35,C39,C43,C56	5	10uF	cap0805	-	C2012X5R1E106 M085AC	TDK Corporation	CAP CER 10UF 25V X5R 0805
7	C36,C40,C44,C55	4	0.1uF	cap0402	-	GRM155R71H1 04KE14J	Murata Electronics	CAP CER 0.1UF 50V X7R 0402
8	C37,C38	2	22uF	C0603	-	GRM188R61A22 6ME15D	Murata	CAP CER 22UF 10V X5R 0603
9	C49,C53	2	1uF	C0402	-	EMK105BJ105K VHF	Taiyo Yuden	CAP CER 1UF 16V X5R 0402
10	C50,C52,C54	3	0.1uF	C0201	-	C0603X5R1C104 K030BC	TDK	CAP CER 0.1UF 16V X5R 0201
11	C51	1	4.7uF	C0402	-	C1005X5R1A47 5K050BC	TDK	CAP CER 4.7UF 10V X5R 0402
12	C89,C90	2	100nF	C0402	-	885012205018	Würth	CAP CER 0.1UF 10V X7R 0402
13	D1	1	5V00	led_0603	-	SML- D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
14	D2	1	1V20	led_0603	-	SML- D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
15	D3	1	1V80	led_0603	-	SML- D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD
16	D5	1	5.1V	SOD323_BZX 384	-	BZX384- C5V1,115	Nexperia USA Inc.	DIODE ZENER 5.1V 300MW SOD323
17	D6	1	2V8/2V9	led_0603	-	SML- D12M8WT86	Rohm Semiconductor	LED GREEN DIFFUSED 0603 SMD

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
18	FB1,FB2	2	742792604	603	-	742792604	Würth Elektronik	FERRITE BEAD 22 OHM 0603 1LN
19	JP1	1	JUMPER	Header_1x2	Default : Pin 1&2	-	-	REGULAR 100MIL HEADER
20	J1	1	ASP-134488-01	ASP-134488-01	-	ASP-134488-01	Samtec Inc.	CONN ARRAY PLUG 400POS SMD GOLD
21	J2,J3	2	HSEC8-130-01-S-RA	HSEC8-130-01-CONN	-	HSEC8-130-01-S-RA	Samtec Inc.	CONN EDGE DUAL FEMALE 60POS 0.031
22	J4	1	2x5_HDR	0p1_2X5-Pin_TH	-	PZC05DAAN	Sullins	CONN HEADER VERT 10POS 2.54MM
23	LD1,LD2,LD3,LD4	4	LED-GRN-0603	LED0603	-	LTST-C190KGKT	Lite-On	LED GREEN CLEAR CHIP SMD
24	L3,L17	2	3.3uH	SRP4020TA-3R3M	-	SRP4020TA-3R3M	Bourns Inc.	FIXED IND 3.3UH 3.5A 76 MOHM SMD
25	L5	1	2.2uH	SRP4020TA-2R2M	-	SRP4020TA-2R2M	Bourns Inc.	FIXED IND 2.2UH 4A 61 MOHM SMD
26	L16	1	1.5uH	2SMD	-	SRP4020TA-1R5M	Bourns Inc.	FIXED IND 1.5UH 4.5A 42 MOHM SMD
27	M1,M2,M3,M4	4	SPACER	SPACER	-	9774020151R	Würth Elektronik	RND STANDOFF M2.5X0.45 STEEL 2MM
28	M1,M2,M3,M4	4	SCREW	-	-	94387A522	Würth Elektronik	M2.5 x 0.45 mm Thread, 10 mm Long
29	Q1,Q2,Q3,Q4,Q5,Q6	6	BSS816NW	SOT-323	-	BSS816NWH632 7XTSA1	Infineon Technologies	MOSFET N-CH 20V 1.4A SOT323-3
30	Q9,Q10,Q12	3	BC817-40-TP	SOT23-3	-	BC817-40-TP	Micro Commercial Co	TRANS NPN 45V 0.8A SOT-23
31	R1	1	0R	603	-	RMCF0603ZTOR00	Stackpole Electronics Inc	RES 0 OHM JUMPER 1/10W 0603
32	R4,R5,R6,R7	4	249R	603	-	RC0603FR-07249RL	Yageo	RES 249 OHM 1% 1/10W 0603
33	R8,R9,R10,R11,R12,R13,R14,R15,R16	9	10K	603	-	RC0603JR-1310KL	Yageo	RES SMD 10K OHM 5% 1/10W 0603
34	R17	1	42.2 k	res0402	-	ERA-2AEB4222X	Panasonic Electronic Components	RES SMD 42.2KOHM 0.1% 1/16W 0402
35	R18,R23,R28,R438	4	12.7 k	res0402	-	ERJ-2RKF1272X	Panasonic Electronic Components	RES SMD 12.7K OHM 1% 1/10W 0402
36	R19	1	56.2K	res0603	-	RE0603FRE0756 K2L	Yageo	RES SMD 56.2K OHM 1% 1/10W 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
37	R20	1	10K	res0603	-	RC0603FR-0710KL	Yageo	RES 10K OHM 1% 1/10W 0603
38	R21,R26,R32,R434	4	1K	R0402	-	CRCW04021K00JNED	Vishay	RES 1.0K OHM 1/16W 5% 0402 SMD
39	R22,R27,R435	3	18.2 k	res0402	-	RT0402BRD0718K2L	YAGEO	RES SMD 18.2KOHM 0.1% 1/16W 0402
40	R24	1	5.76K	603	-	RC0603FR-075K76L	Yageo	RES SMD 5.76K OHM 1% 1/10W 0603
41	R25,R30,R439	3	10K	603	-	RC0603FR-0710KL	Yageo	RES SMD 10K OHM 1% 1/10W 0603
42	R29	1	13.7K	603	-	RC0603FR-0713K7L	Yageo	RES SMD 13.7K OHM 1% 1/10W 0603
43	R31,R432,R437	3	10K	res0603	-	RC1608F103CS	Samsung Electro-Mechanics	RES SMD 10K OHM 1% 1/10W 0603
44	R33,R109	2	33	R0402	-	RC0402FR-0733RL	Yageo	RES SMD 33 OHM 1% 1/16W 0402
45	R60,R61,R107,R108	4	4.7k	R0402	-	RC0402FR-074K7L	Yageo	RES SMD 4.7K OHM 1% 1/16W 0402
46	R73,R443	2	100k	R0402	-	ERJ-2RKF1003X	Panasonic	RES 100K OHM 1/10W 1% 0402 SMD
47	R75,R444	2	22	R0402	-	ERJ-2RKF22R0X	Panasonic	RES SMD 22 OHM 1% 1/10W 0402
48	R441	1	28.7K	603	-	RC0603FR-0728K7L	Yageo	RES 28.7K OHM 1% 1/10W 0603
49	R442	1	604K	603	-	RC0603FR-07604KL	Yageo	RES 604K OHM 1% 1/10W 0603
50	U1	1	CAT24C64 HU4	8-UFDFN	-	CAT24C64HU4I-GT3	ON Semiconductor	IC EEPROM 64KBIT I2C 1MHZ 8UDFN
51	U2,U4	2	RC22504A	VFQFPN-24	-	RC22504A000G NK#BB0	Renesas Electronics America Inc	FEMTOCLOCK 2 SYNTHESIZER
52	U3	1	TMUX1136 DQAR	UFDFN-10	-	TMUX1136DQAR	TI	2 Circuit IC Switch 2:1 40hm 10-USON (2.5x1)
53	U5,U6,U7,U9	4	AP62300T WU-7	TSOT26_AP6 2300TWU-7	-	AP62300TWU-7	Diodes Incorporated	DCDC CONV HV BUCK,TSOT26,T&R,3K
54	V1,V2,V3,V4	4	Fiducial	1mm x 1mm	DNL	-	N/A	1mm x 1mm
55	X1	1	25.00 MHz	XTAL_XRCGB 25M	-	XRCGB25M000F AN00R0	Murata Electronics	CRYSTAL 25.0000MHZ 6PF SMD
56	X2	1	27.00 MHz	XTAL_XRCGB	-	XRCGB27M000F	Murata Electronics	CRYSTAL 27.0000MHZ 8PF SMD

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
				27M		2P01R0		
57	X3,X4	2	ASE3-27.000MH z-K-T	27MHZ	-	ASE3-27.000MHz-K-T	Abracon Corporation	XTAL OSC XO 27.0000MHZ CMOS SMD
58	3P3VAUX,5V00	2	VTTVREF	TP_50	DNL	-	-	Test Points
59	Shunt For JP1 Header	1			-	SNT-100-BK-T	Samtec Inc.	2 (1 x 2) Position Shunt Connector Black Open Top 0.100" (2.54mm) Tin
60	FMC Base Board REVA PCB	1			-	305-PD-23-0161	PACTRON	

Appendix C – DisplayPort Receiver Daughter Card Schematics

	5	4	3	2	1	
D	LF-DP-FMCRX-EVN Rev - B					D
C	01 - Title Page 02 - Mezzanine Connector 03 - DisplayPort Connector					C
B						B
A						A
	5	4	3	2	1	



Lattice Semiconductor Applications
Email: techsupport@latticesemi.com

Title		Title Page	
Size	Project	Schematic Rev	1.0
B	LF-DP-FMCRX-EVN	Board Rev	B
Date: Thursday, February 23, 2023		Sheet	1 of 3

Figure C.1. DisplayPort Receiver Daughter Card Title Page

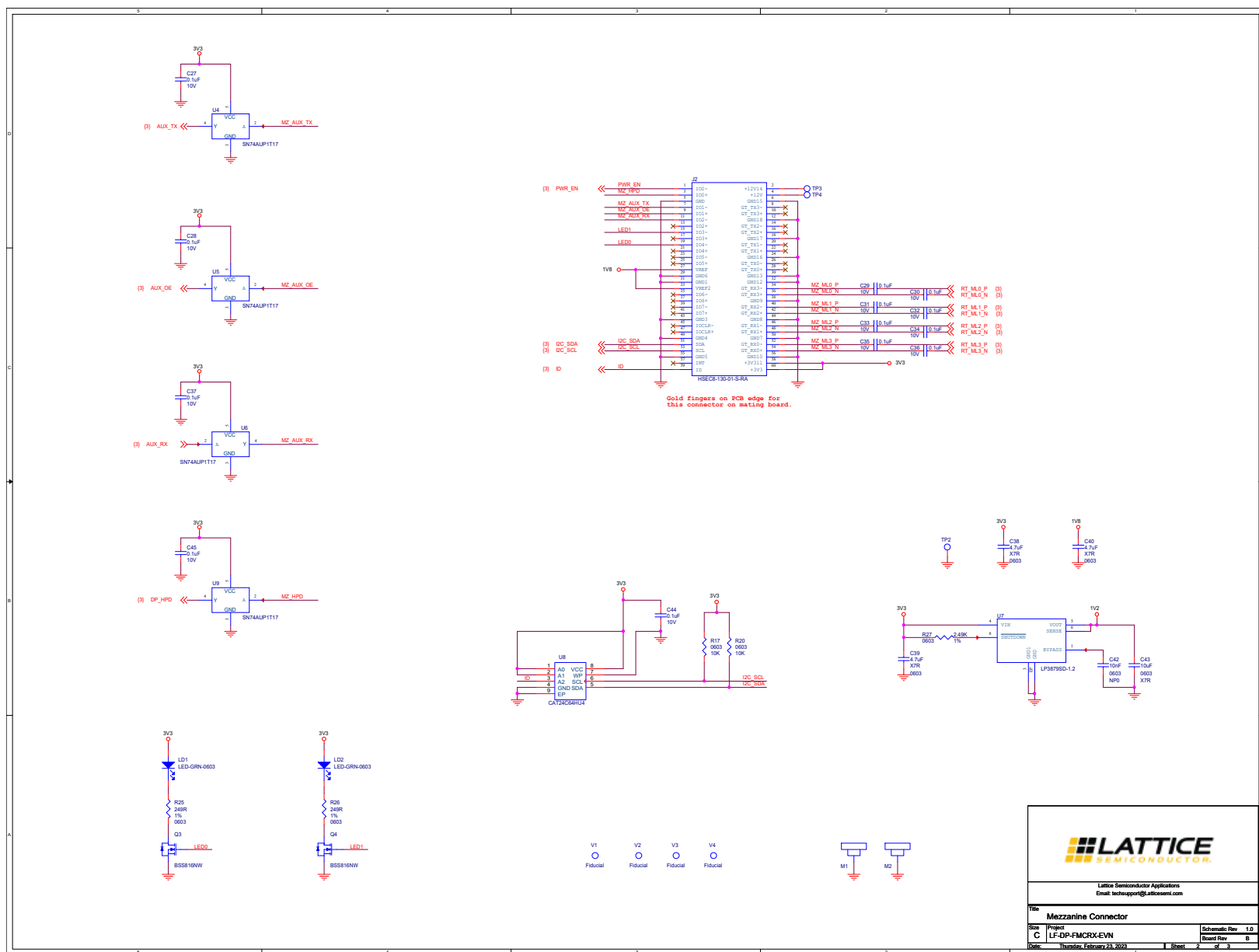


Figure C.2. Mezzanine Connector

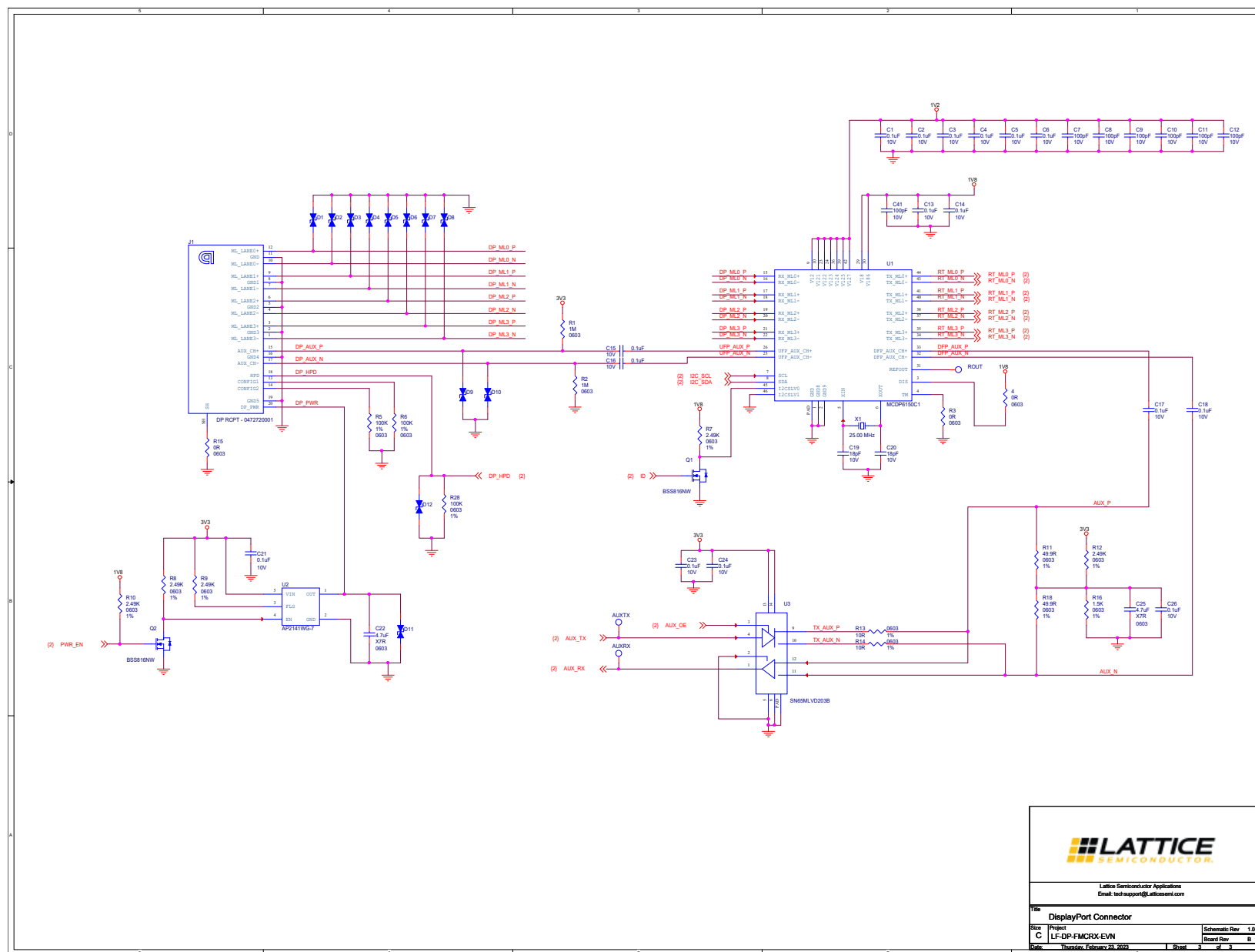


Figure C.3. DisplayPort Connector

Appendix D – DisplayPort Receiver Daughter Card Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
1	TP2,TP3,TP4,ROUT,AUXTX,AU XRX	6	TestPoint	TP50	DNL	-	-	Test Points
2	C1,C2,C3,C4,C5,C6,C13,C14,C 15,C16,C17,C18,C21,C23,C24, C26,C27,C28,C29,C30,C31,C3 2,C33,C34,C35,C36,C37,C44,C 45	29	0.1uF	C0402	-	GRM155R61A10 4KA01J	Murata Electronics	CAP CER 0.1UF 10V X5R 0402
3	C7,C8,C9,C10,C11,C12,C41	7	100pF	C0402	-	C0402C101K8R AC7867	KEMET	CAP CER 100PF 10V X7R 0402
4	C19,C20	2	18pF	C0402	-	C0402C180J8GA C7867	KEMET	CAP CER 18PF 10V NPO 0402
5	C22	1	4.7uF	C0603	-	GRM188Z71A47 5KE15D	Murata Electronics	CAP CER 4.7UF 10V X7R 0603
6	C25,C38,C39,C40	4	4.7uF	C0603	-	GRM188Z71A47 5ME15D	Murata Electronics	CAP CER 4.7UF 10V X7R 0603
7	C42	1	10nF	C0603	-	C0603C103G8G AC7867	Kemet	CAP CER 10000PF 10V NPO 0603
8	C43	1	10uF	C0603	-	GRM188Z71A10 6KA73D	Murata	CAP CER 10UF 10V X7R 0603
9	D1,D2,D3,D4,D5,D6,D7,D8,D9 ,D10,D11,D12	12	NA	402	DNL	TPD1E0B04DPY T	Texas Instruments	TVS DIODE 3.6VWM 19VC 2X1SON
10	J1	1	DP RCPT - 047272000 1	DisplayPort_ Connector	-	472720001	Molex	CONN RCPT DISPLAYPORT 20P SMD RA
11	J2	1	HSEC8- 130-01-S- RA	HSEC8-130- 01-CONN	-	HSEC8-130-01- S-RA	Samtec Inc.	CONN EDGE DUAL FEMALE 60POS 0.031
12	LD1,LD2	2	LED-GRN- 0603	LED0603	-	LTST-C190KGKT	Lite-On	LED GREEN CLEAR CHIP SMD
13	M1,M2	2	SPACER	SPACER	-	9774020151R	Würth Elektronik	RND STANDOFF M2.5X0.45 STEEL 2MM
14	Q1,Q2,Q3,Q4	4	BSS816NW	SOT-323	-	BSS816NWH632 7XTSA1	Infineon Technologies	MOSFET N-CH 20V 1.4A SOT323-3
15	R1,R2	2	1M	603	-	RC0603JR- 071ML	YAGEO	RES 1M OHM 5% 1/10W 0603
16	R3,4,R15	3	0R	603	-	RMCF0603ZTOR 00	Stackpole Electronics Inc	RES 0 OHM JUMPER 1/10W 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
17	R5,R6,R28	3	100K	603	-	RC0603FR-07100KL	Yageo	RES 100K OHM 1% 1/10W 0603
18	R7,R8,R9,R10,R12,R27	6	2.49K	603	-	RC0603FR-072K49L	Yageo	RES 2.49K OHM 1% 1/10W 0603
19	R11,R18	2	49.9R	603	-	RC0603FR-0749R9L	Yageo	RES 49.9 OHM 1% 1/10W 0603
20	R13,R14	2	10R	603	-	RC0603FR-0710RL	Yageo	RES 10 OHM 1% 1/10W 0603
21	R16	1	1.5K	603	-	RC0603FR-071K5L	Yageo	RES 1.5K OHM 1% 1/10W 0603
22	R17,R20	2	10K	603	-	RC0603JR-1310KL	Yageo	RES SMD 10K OHM 5% 1/10W 0603
23	R25,R26	2	249R	603	-	RC0603FR-07249RL	Yageo	RES 249 OHM 1% 1/10W 0603
24	U1	1	MCDP6150 C1	VQFN-46	-	MCDP6150C1	Kinetic Technologies	DP1.4A LINK TRAINING TUNABLE PHY
25	U2	1	AP2141WG-7	SOT-25	-	AP2141WG-7	Diodes Incorporated	IC PWR SWITCH P-CHAN 1:1 SOT25
26	U3	1	SN65MLVD203B	WQFN-16	-	SN65MLVD203B RUMR	Texas Instruments	IC TRANSCEIVER FULL 1/1 16WQFN
27	U4,U5,U6,U9	4	SN74AUP1T17	SC-70-5	-	SN74AUP1T17D CKR	Texas Instruments	IC BUF NON-INVERT 3.6V SC70-5
28	U7	1	LP3879SD-1.2	WSON-8	-	LP3879SD-1.2	Texas Instruments	IC REG LINEAR 1.2V 800MA 8WSON
29	U8	1	CAT24C64 HU4	8-UFDFN	-	CAT24C64HU4I-GT3	ON Semiconductor	IC EEPROM 64KBIT I2C 1MHZ 8UDFN
30	V1,V2,V3,V4	4	Fiducial	1mm x 1mm	DNL	N/A	N/A	1mm x 1mm
31	X1	1	25.00 MHz	SMD_4	-	XRCGB25M000F3M00R0	Murata Electronics	CRYSTAL 25.0000MHZ 6PF SMD
32	LF-DP-FMCRX-EVN BRD PCB REV B	1			-	305-PD-23-0XXX	PACTRON	

Appendix E – DisplayPort Transmitter Daughter Card Schematics

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LF-DP-FMCTX-EVN Rev - A																				
01 - Title Page 02 - Mezzanine Connector 03 - DisplayPort Connector																				
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Lattice Semiconductor Applications Email: techsupport@latticesemi.com																				
<table border="1"> <tr> <td colspan="4">Title Page</td> </tr> <tr> <td>Size</td> <td>Project</td> <td colspan="2">Schematic Rev</td> </tr> <tr> <td>B</td> <td>LF-DP-FMCTX-EVN</td> <td colspan="2">1.0</td> </tr> <tr> <td>Date</td> <td>Thursday, April 13, 2023</td> <td>Sheet</td> <td>1 of 3</td> </tr> </table>					Title Page				Size	Project	Schematic Rev		B	LF-DP-FMCTX-EVN	1.0		Date	Thursday, April 13, 2023	Sheet	1 of 3
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Size	Project	Schematic Rev																		
B	LF-DP-FMCTX-EVN	1.0																		
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Figure E.1. DisplayPort Transmitter Daughter Card Title Page





Appendix F – DisplayPort Transmitter Daughter Card Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
1	TP3,TP4,TP5,AUXTX,AUXRX	5	TestPoint	TP50	DNL	-	-	Test Points
2	C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C14,C15,C18,C19,C20,C21,C27,C28,C29,C30,C31,C32,C33,C34,C35,C36,C37,C40	30	0.1uF	C0402	-	GRM155R61A104KA01J	Murata Electronics	CAP CER 0.1UF 10V X5R 0402
3	C13,C38	2	4.7uF	C0603	-	GRM188Z71A475ME15D	Murata Electronics	CAP CER 4.7UF 10V X7R 0603
4	C17	1	4.7uF	C0603	-	GRM188R61A475ME15D	Murata Electronics	CAP CER 4.7uF 10V X5R 0603
5	C22,C23,C24,C25	4	100pF	C0402	-	C0402C101K8RAC7867	KEMET	CAP CER 100PF 10V X7R 0402
6	C26	1	4.7uF	C0603	-	GRM188Z71A475KE15D	Murata Electronics	CAP CER 4.7UF 10V X7R 0603
7	D1,D2,D3,D4,D5,D6,D7,D8,D9,D10,D11,D12	10	NA	402	-	TPD1E0B04DPYT	Texas Instruments	TVS DIODE 3.6VWM 19VC 2X1SON
8	L1	1	742792604	603	-	742792604	Würth Elektronik	FERRITE BEAD 22 OHM 0603 1LN
9	J2	1	DP RCPT - 0472720001	DisplayPort_Connector	-	472720001	Molex	CONN RCPT DISPLAYPORT 20P SMD RA
10	LD1,LD2	2	LED-GRN-0603	LED0603	-	LTST-C190KGKT	Lite-On	LED GREEN CLEAR CHIP SMD
11	M1,M2	2	SPACER	SPACER	-	9774020151R	Würth Elektronik	RND STANDOFF M2.5X0.45 STEEL 2MM
12	Q1,Q2,Q3,Q4	4	BSS816NW	SOT-323	-	BSS816NWH6327XTSA1	Infineon Technologies	MOSFET N-CH 20V 1.4A SOT323-3
13	R1,R10	2	49.9R	603	-	RC0603FR-0749R9L	Yageo	RES 49.9 OHM 1% 1/10W 0603
14	R2,R4	2	10R	603	-	RC0603FR-0710RL	Yageo	RES 10 OHM 1% 1/10W 0603
15	R3	1	2.49K	603	-	RC0603FR-072K49L	Yageo	RES 2.49K OHM 1% 1/10W 0603
16	R7	1	1.5K	603	-	RC0603FR-071K5L	Yageo	RES 1.5K OHM 1% 1/10W 0603
17	R5,R6,R8,R9,R12	3	100K	603	-	RC0603FR-	Yageo	RES 100K OHM 1% 1/10W 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
						07100KL		
18	R11,R13,R14,R15,R25,R26	6	10K	603	-	RC0603JR-1310KL	Yageo	RES SMD 10K OHM 5% 1/10W 0603
19	R16,R17,R18,R24	4	0R	603	-	RMCF0603ZTOR00	Stackpole Electronics Inc	RES 0 OHM JUMPER 1/10W 0603
20	R19,R20,R21	3	1K	603	-	RC0603FR-071KL	Yageo	RES 1K OHM 1% 1/10W 0603
21	R22,R23	2	249R	603	-	RC0603FR-07249RL	Yageo	RES 249 OHM 1% 1/10W 0603
22	U2	1	AP2141WG-7	SOT-25	-	AP2141WG-7	Diodes Incorporated	IC PWR SWITCH P-CHAN 1:1 SOT25
23	U3	1	TDP142RNQT	WQFN-40	-	TDP142RNQT	Texas Instruments	IC INTERFACE SPECIALIZED 40WQFN
24	U4,U5,U6	3	SN74AUP1T17	SC-70-5	-	SN74AUP1T17DCKR	Texas Instruments	IC BUF NON-INVERT 3.6V SC70-5
25	U7	1	CAT24C64HU4	8-UDFN	-	CAT24C64HU4I-GT3	ON Semiconductor	IC EEPROM 64KBIT I2C 1MHZ 8UDFN
26	U1	1	SN65MLVD203B	WQFN-16	-	SN65MLVD203BRUMR	Texas Instruments	IC TRANSCEIVER FULL 1/1 16WQFN
27	V1,V2,V3,V4	4	Fiducial	1mm x 1mm	DNL	N/A	N/A	1mm x 1mm
28	LF-DP-FMCTX-EVN Board PCB REVA	1			-	305-PD-23-0XXX	PACTRON	

Appendix G – Embedded DisplayPort Transmitter Daughter Card Schematics

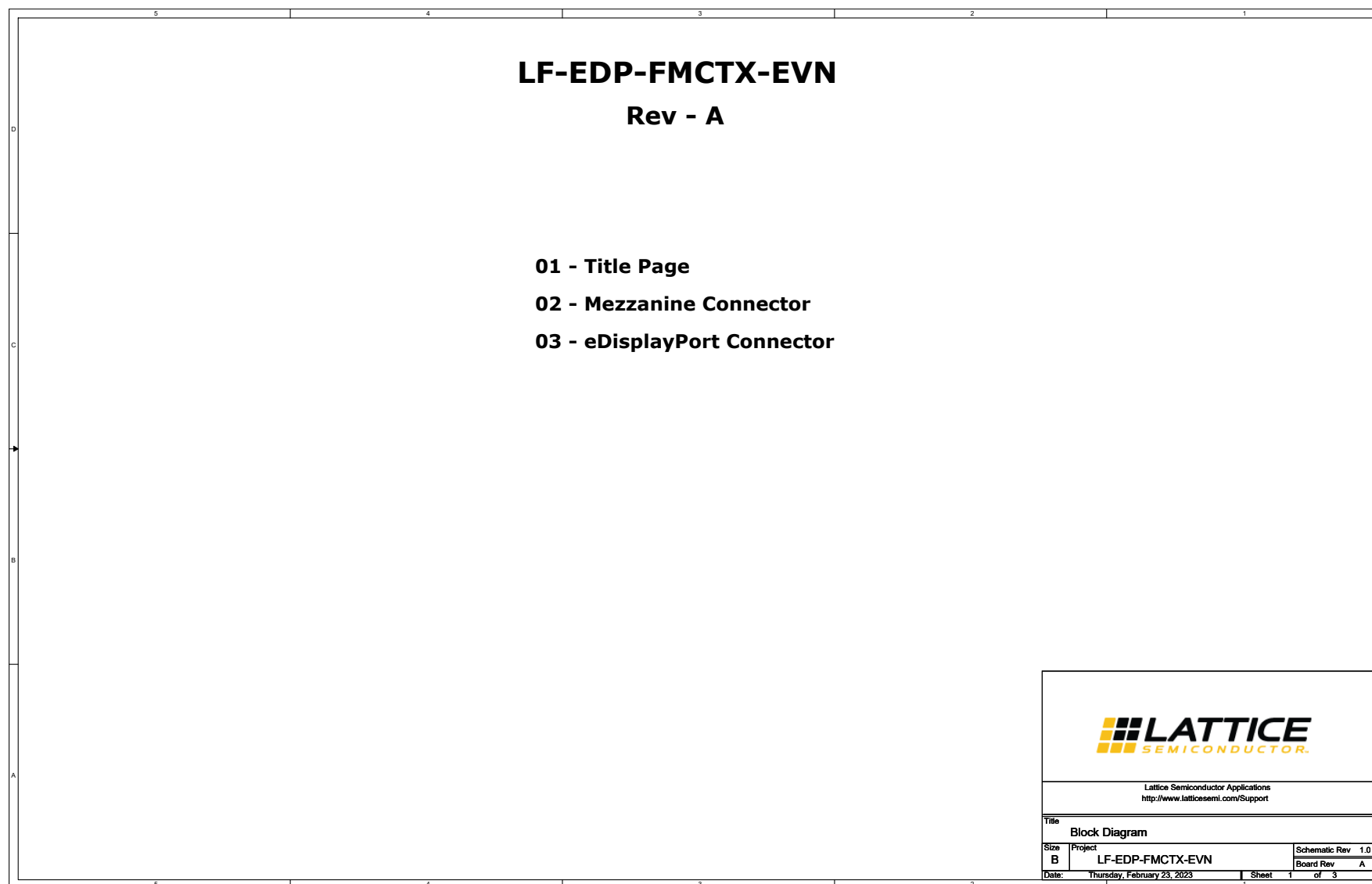


Figure G.1. Embedded DisplayPort Transmitter Daughter Card Title Page

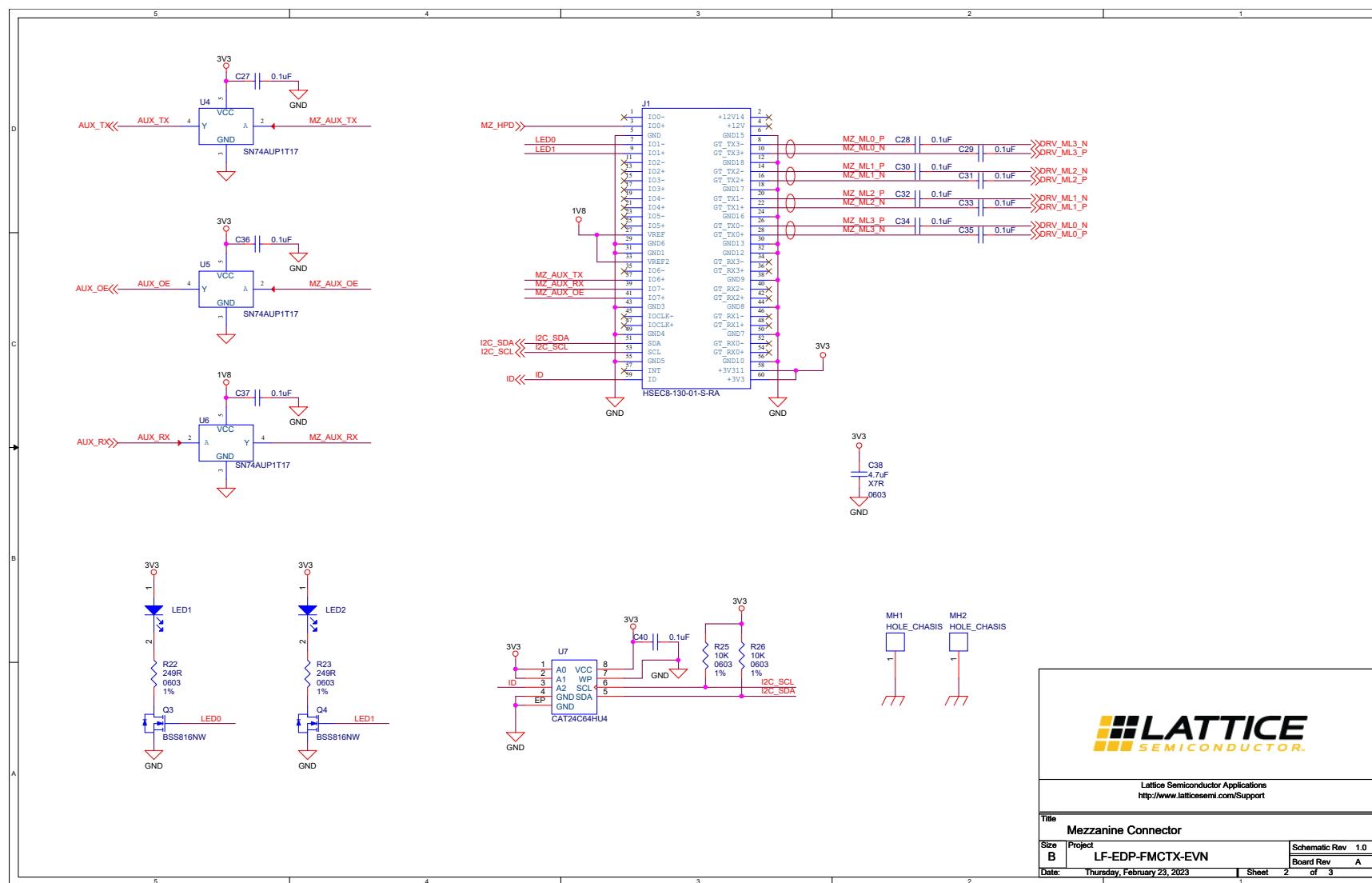


Figure G.2. Mezzanine Connector

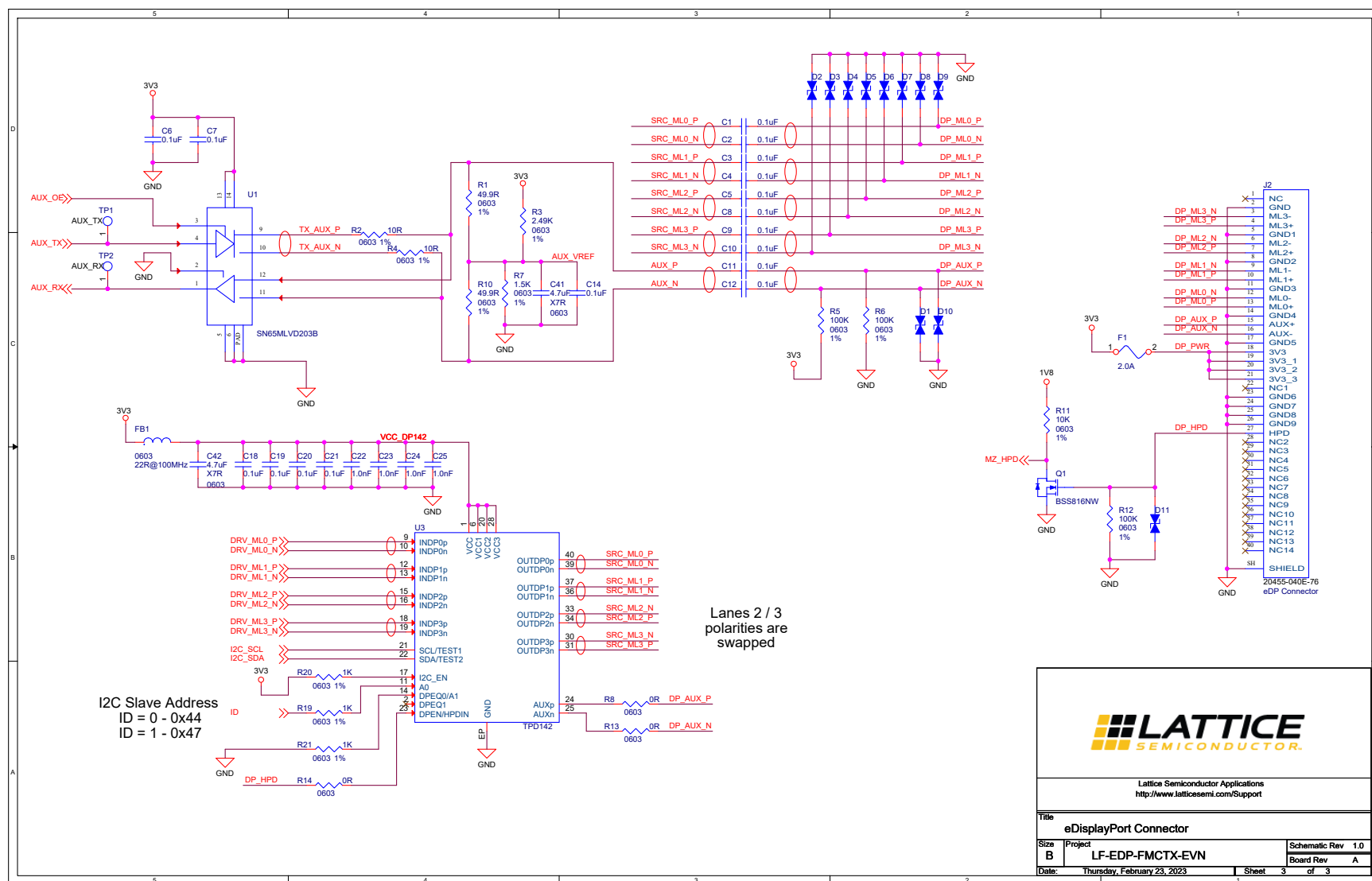


Figure G.3. Embedded DisplayPort Connector

Appendix H – Embedded DisplayPort Transmitter Daughter Card Bill of Materials

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
1	C1,C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C14,C18,C19,C20,C21,C27,C28,C29,C30,C31,C32,C33,C34,C35,C36,C37,C40	29	0.1uF	C0402	-	GRM155R61A104KA01J	Murata Electronics	CAP CER 0.1UF 10V X5R 0402
2	C22,C23,C24,C25	4	1.0nF	C0201	-	GRM033R71H102KA12D	Murata Electronics	CAP CER 1000PF 50V X7R 0201
3	C38,C13,C17	3	4.7uF	C0603	-	GRM188Z71A475ME15D	Murata Electronics	CAP CER 4.7UF 10V X7R 0603
4	D1,D2,D3,D4,D5,D6,D7,D8,D9,D10,D11	11	NA	402	-	TPD1E0B04DPYT	Texas Instruments	TVS DIODE 3.6VWM 19VC 2X1SON
5	L1	1	742792604	603	-	742792604	Würth Elektronik	FERRITE BEAD 22 OHM 0603 1LN
6	P1	1	2.0A	SMT	-	1206L200PR	Littelfuse	PTC RESET FUSE 6V 2A 1206
7	J2	1	eDP Connector	IPEX_20455-040E-76	-	20455-040E-76	I-PEX	CABLINE-VS RECEPTACLE 40P
8	LD1,LD2	2	G LED	SMT	-	APT1608CGCK	Kingbright Corp	LED GREEN CLEAR CHIP SMD
9	MH1,MH2	2	HOLE_CHASSIS	hole35mmheader	DNL	-	-	-
10	Q1,Q3,Q4	3	BSS816NW	SOT-323	-	BSS816NWH6327XTSA1	Infineon Technologies	MOSFET N-CH 20V 1.4A SOT323-3
11	R1,R10	2	49.9R	603	-	RC0603FR-0749R9L	Yageo	RES 49.9 OHM 1% 1/10W 0603
12	R2,R4	2	10R	603	-	RC0603FR-0710RL	Yageo	RES 10 OHM 1% 1/10W 0603
13	R3	1	2.49K	603	-	RC0603FR-072K49L	Yageo	RES 2.49K OHM 1% 1/10W 0603
14	R5,R6,R12	3	100K	603	-	RC0603FR-07100KL	Yageo	RES 100K OHM 1% 1/10W 0603
15	R7	1	1.5K	603	-	RC0603FR-071K5L	Yageo	RES 1.5K OHM 1% 1/10W 0603
16	R8,R13,R14	3	0R	603	-	RMCF0603ZTOR00	Stackpole Electronics Inc	RES 0 OHM JUMPER 1/10W 0603
17	R11,R25,R26	3	10K	603	-	RC0603FR-0710KL	Yageo	RES SMD 10K OHM 1% 1/10W 0603
18	R19,R20,R21	3	1K	603	-	RC0603FR-071KL	Yageo	RES 1K OHM 1% 1/10W 0603

Item	Reference	Qty	Value	PCB Footprint	Comments	Manufacturer Part Number	Manufacturer	Description
19	R22,R23	2	249R	603	-	RC0603FR-07249RL	Yageo	RES 249 OHM 1% 1/10W 0603
20	TP1,TP2	2	Tpoint	tp_1mm1mm	DNL	N/A	N/A	TEST POINT - 1mm x 1mm pad
21	U1	1	SN65MLVD203B	WQFN-16	-	SN65MLVD203B RUMR	TI	IC TRANSCEIVER FULL 1/1 16WQFN
22	U3	1	TPD142	TI_WQFN-40	-	TDP142RNQT	TI	IC INTERFACE SPECIALIZED 40WQFN
23	U4,U5,U6	3	SN74AUP1T17	SC-70-5	-	SN74AUP1T17D CKR	TI	IC BUF NON-INVERT 3.6V SC70-5
24	U7	1	CAT24C64HU4	8-UFDFN	-	CAT24C64HU4I-GT3	ON Semiconductor	IC EEPROM 64KBIT I2C 1MHZ 8UDFN
25	LF-EDP-FMCTX-EVN Board PCB REVA	1			-	305-PD-23-0XXX	PACTRON	

Revision History

Revision 1.0, July 2023

Section	Change Summary
All	Initial release.



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