



HDMI VIP Output Bridge Board

Evaluation Board User Guide

FPGA-EB-02003 Version 1.1

June 2017

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
CPI	CEC Programming Interface
DVI	Digital Visual Interface
GPIO	General Purpose Input/Output
HDCP	High-Definition Content Protection
HDMI	High Definition Multimedia Interface
I ² C	Inter-Integrated Circuit
LDO	Low Dropout
TMDS	Transition-Minimized Differential Signaling
TPI	Transmitter Programming Interface
VIP	Video Interface Platform

1. Introduction

This document describes the Lattice Semiconductor HDMI[®] VIP Output Bridge Board. This board is designed to work with the Lattice Video Interface Platform board interconnect system. The board's key component is the Lattice Semiconductor SiI1136 HDMI Deep Color Transmitter.

The content of this user guide includes descriptions of board components, schematics, and bill of materials.

Key features of the HDMI VIP output bridge board include:

- SiI1136 HDMI deep color transmitter
 - Video Input: Supports video resolutions up to 8-bit 4K (30 Hz), 12-bit 1080p (60 Hz), 12-bit 720p/1080i (120 Hz), and 16-bit 1080p (30 Hz)
 - HDMI Output: DVI and HDMI transmitter with xvYCC extended color gamut, deep color up to 16-bit color, 3D, and high bitrate audio support
 - Up to 300 MHz TMDS Output Clock
 - No HDCP support
- Single-Link 19-pin HDMI Type-A connector
- Two 60-pin rugged high-speed headers

Figure 1.1 shows the top view of the HDMI VIP output bridge board and its key components. Figure 1.2 on the next page shows the bottom view of the board.

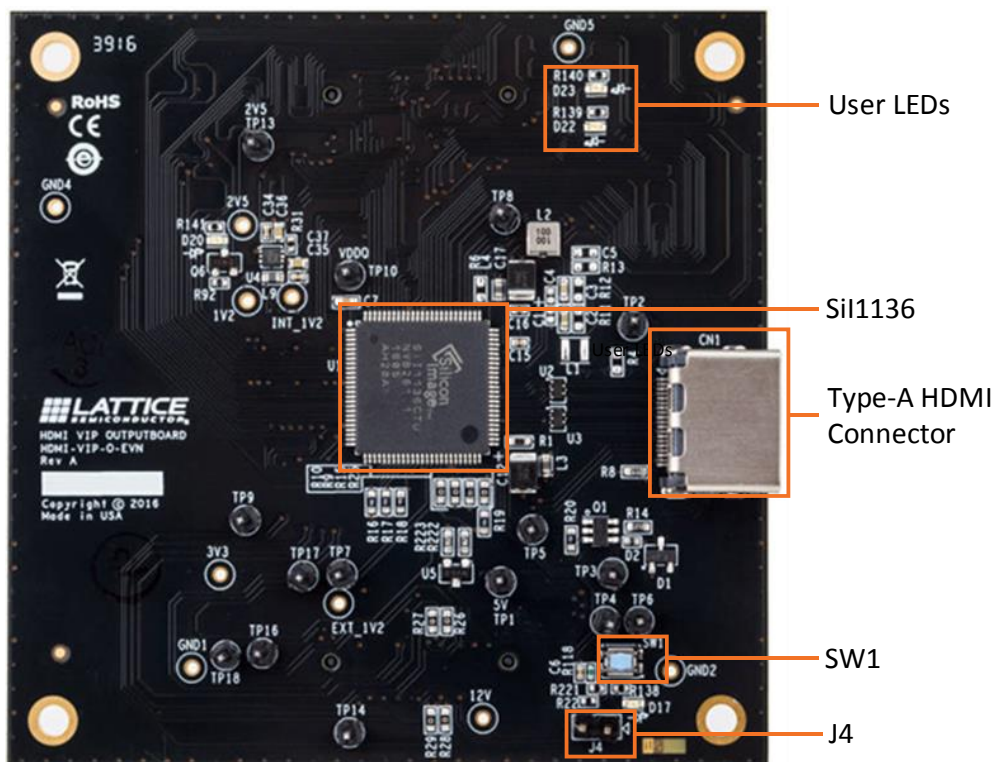


Figure 1.1. Top View of HDMI VIP Output Bridge Board

1.1. Further Information

For more information on boards and kits available for the VIP system, visit www.latticesemi.com/boards

For details about the SiI1136 device refer to SiI-DS-1084, [SiI9136-3/SiI1136 HDMI Deep Color Transmitter Data Sheet](#).

Refer to [Appendix A](#) and [Appendix B](#) for the schematics and BOM of the HDMI VIP Output Bridge board.

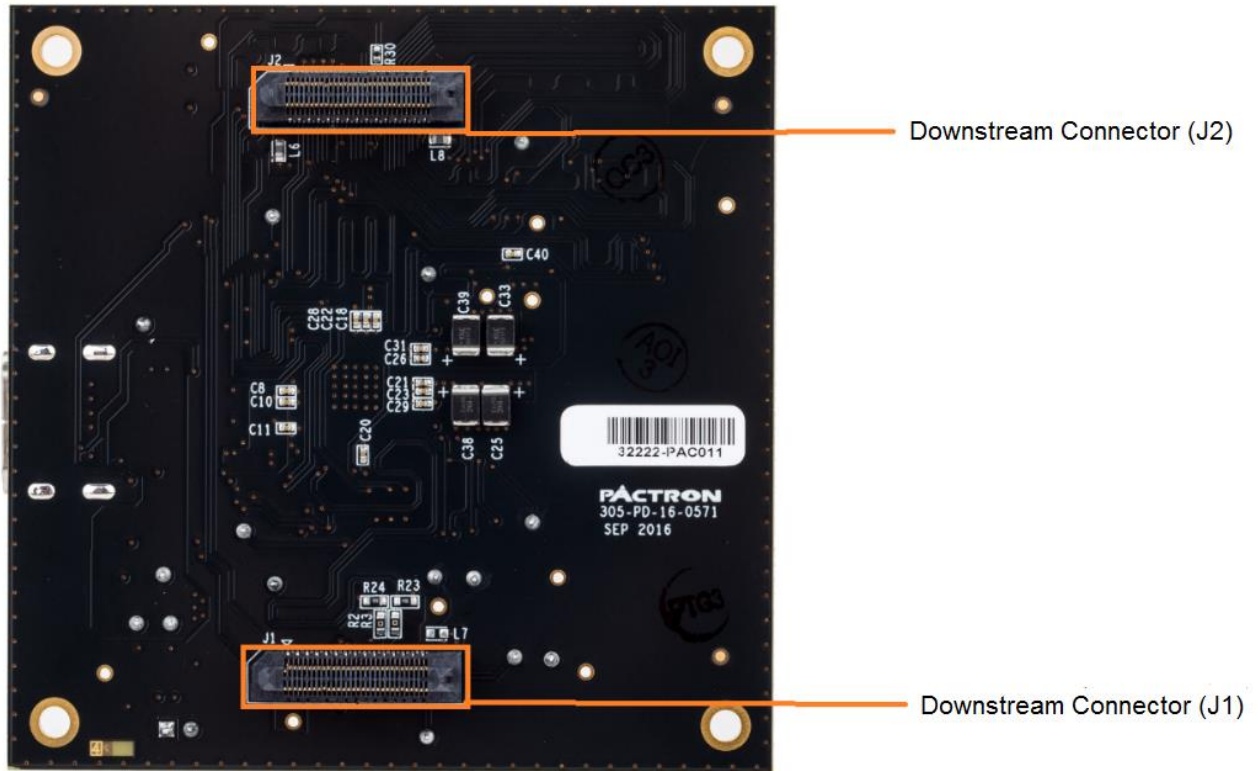


Figure 1.2. Bottom View of HDMI VIP Output Bridge Board

2. Functional Description

The SiI1136 receives RGB or YCbCr parallel video data and I²S audio from connectors J1 and J2. Based on the configuration, the SiI1136 converts the incoming data to HDMI or DVI and outputs to the HDMI Type-A connector.

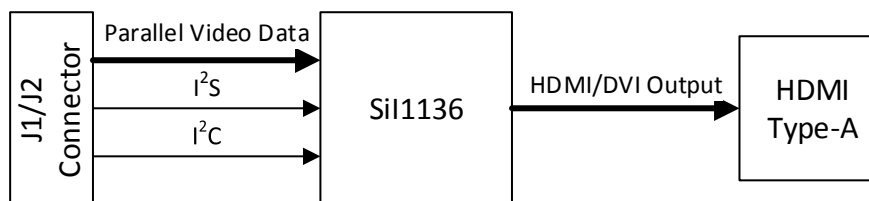


Figure 2.1. Functional Block Diagram

The SiI1136 transmitter is configured using the I²C interface from connector J1. The I²C registers monitor and control all functions of the SiI1136 transmitter. The device address select pin CI2CA on the SiI1136 is pulled high, see [Table 2.1](#) for the corresponding I²C addresses. For configuration, refer to the SiI9136-3 and SiI9334 HDMI Transmitter Programmer's Reference for complete information. *The Programmer's Reference requires an NDA with Lattice Semiconductor.*

Table 2.1. SiI1136 7-bit I²C Address

Block	CI2CA = 1
Configuration Registers	0x3F
TPI	0x3B
CPI	0x62

2.1. Reset

The push button switch SW1 controls the reset signal HDMI_RESET. Pressing the push-button sends logic 0 to the SiI1136 RESET# pin. The HDMI_RESET pin can be connected to the GSRN pin on connector J1 by closing jumper J4, allowing SW1 to control the reset signal for other connected boards.

2.2. HDMI Interface

The HDMI Type A connector connects the HDMI VIP output board to an HDMI Sink (that is a monitor). ESD protection is provided on the TMDS signals.

3. High-Speed Headers and Jumper

Two 60-pin high speed headers, connectors J1 and J2, are used to connect to a host board.

Jumper J4 – When jumper J4 is closed, it connects the HDMI_RESET pin to the GSRN pin on connector J1.

Table 3.1. Connector J1

J1 Connector Pin	Signal Name	Sil1136 Pin
1	GND	—
2	12V	—
4	12V	—
6	12V	—
7	GND	—
8	12V	—
13	GND	—
14	GND	—
19	GND	—
20	GND	—
21	HDMI_VSYNC	VSYNC
22	HDMI_HSYNC	HSYNC
23	HDMI_DE	DE
24	HDMI_IDCK	IDCK
25	TP18	—
26	GND	—
28	RESET	See Note*
30	DW_GPIO35	D34
32	DW_GPIO36	D35
34	GND	—
39	TP19	—
40	GND	—
41	CSCL	CSCL
43	CSDA	CSDA
46	GND	—
52	GND	—
53	TP16	—
55	GND	—
57	1.2V	—
58	GND	—
59	1.2V	—
60	TP14	—
3, 5, 9–12, 15–18, 27, 29, 31, 33, 35–38, 42, 44, 45, 47–51, 54, 56	No Connection	—

***Note:** Jumper J4 connects GSRN to HDMI_RESET.

Table 3.2. Connector J2

J2 Connector Pin	Signal Name	Sil1136 Pin
1	3.3 V	—
2	3.3 V	—
3	3.3 V	—
4	3.3 V	—
5	DW_GPIO1	D0
6	DW_GPIO25	D24
7	DW_GPIO2	D1
8	DW_GPIO26	D25
9	DW_GPIO3	D2
10	DW_GPIO27	D26
11	DW_GPIO4	D3
12	DW_GPIO28	D27
13	DW_GPIO5	D4
14	DW_GPIO29	D28
15	DW_GPIO6	D5
16	DW_GPIO30	D29
17	DW_GPIO7	D6
18	DW_GPIO31	D20
19	DW_GPIO8	D9
20	GND	—
21	GND	—
22	DW_GPIO16	D15
23	LED1	—
24	DW_GPIO32	D31
25	DW_GPIO33	D32
26	DW_GPIO34	D33
27	HDMI_MCLK	MCLK
28	HDMI_SDO_DL0	SDO/DL0
29	HDMI_SCK	SCK
30	HDMI_SD1_DR1	SD1/DR1
31	HDMI_WS_DR0	WS/DR0
32	HDMI_SD2_DL1	SD2/DL1
33	HDMI_INT	IRQ
34	HDMI_SD3_DR2	SD3/DR2
35	DW_GPIO23	D22
36	DW_GPIO24	D23
37	HMDI_RESET	RESET_N
38	LED2	—
39	GND	—
40	GND	—
41	DW_GPIO17	D16
42	DW_GPIO9	D8
43	DW_GPIO18	D17
44	DW_GPIO10	D9
45	DW_GPIO19	D18
46	DW_GPIO11	D10

Table 3.2. Connector J2 (Continued)

J2 Connector Pin	Signal Name	Si1136 Pin
47	DW_GPIO20	D19
48	DW_GPIO12	D11
49	DW_GPIO21	D20
50	DW_GPIO13	D12
51	DW_GPIO22	D21
52	DW_GPIO14	D13
53	GND	—
54	DW_GPIO15	D14
55	GND	—
56	GND	—
57	2.5 V	—
58	2.5 V	—
59	2.5 V	—
60	2.5 V	—

4. Power Supply

Board power is supplied through connectors J1 and J2.

Figure 4.1 shows the power distribution scheme.

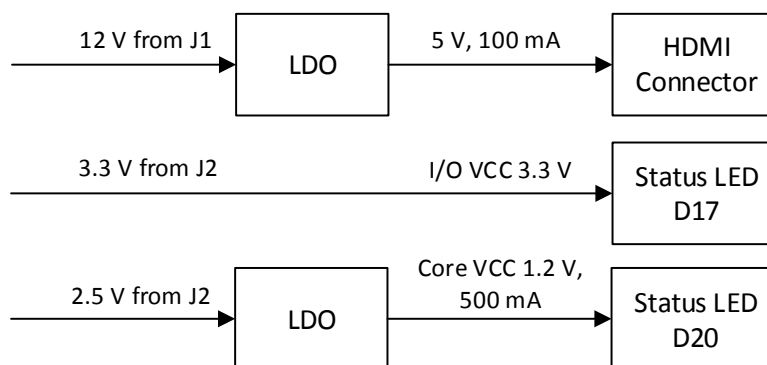


Figure 4.1. Power Supply

5. Status Indicators and Test Points

Two discrete LEDs on the board show the application status. These are driven by connector J2. [Table 5.1](#) lists the status LED I/O map.

Table 5.1. Status LED I/O Map

Signal	LED Number	J2-Pin	Color
LED1	D23	23	Green
LED2	D22	38	Green

Table 5.2. Test Points

Test Point	Connection
TP1	5 V supply to HDMI Connector
TP3	CEC A from HDMI Connector
TP5	Si1136 Pin 40/CEC_A
TP6	Si1136 Pin 49/GPIO3
TP7	Si1136 Pin 39/GPIO2
TP8	Si1136 Pin 77/GPIO1
TP9	Si1136 Pin 26/GPIO0
TP13	2.5 V supply from J2
TP14	J1 Pin 60
TP16	J1 Pin 53
TP17	J1 Pin 29
TP18	J1 Pin 25

6. Ordering Information

This board is included as part of a kit, and not available as a separate item. The below part number is for reference only, so it is clear which board is described in this document. Please visit www.latticesemi.com/boards for the latest ordering information.

Table 6.1. Reference Part Number

Description	Ordering Part Number
HDMI VIP Output Bridge Board	HDMI-VIP-OB-EVN

References

For more information, refer to:

- SiI-DS-1084, [SiI9136-3/SiI1136 HDMI Deep Color Transmitter Data Sheet](#)
- SiI-PR-1060, SiI9136-3 and SiI9334 HDMI Transmitter Programmer's Reference (*The Programmer's Reference requires an NDA with Lattice Semiconductor*)
- FPGA-UG-02015, [Lattice Embedded Vision Development Kit User Guide](#)
- FPGA-EB-02001, [ECP5 VIP Processing Board](#)
- FPGA-EB-02002, [CrossLink VIP Input Bridge Board](#)

Technical Support Assistance

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

Appendix A. HDMI VIP Output Bridge Board Schematics

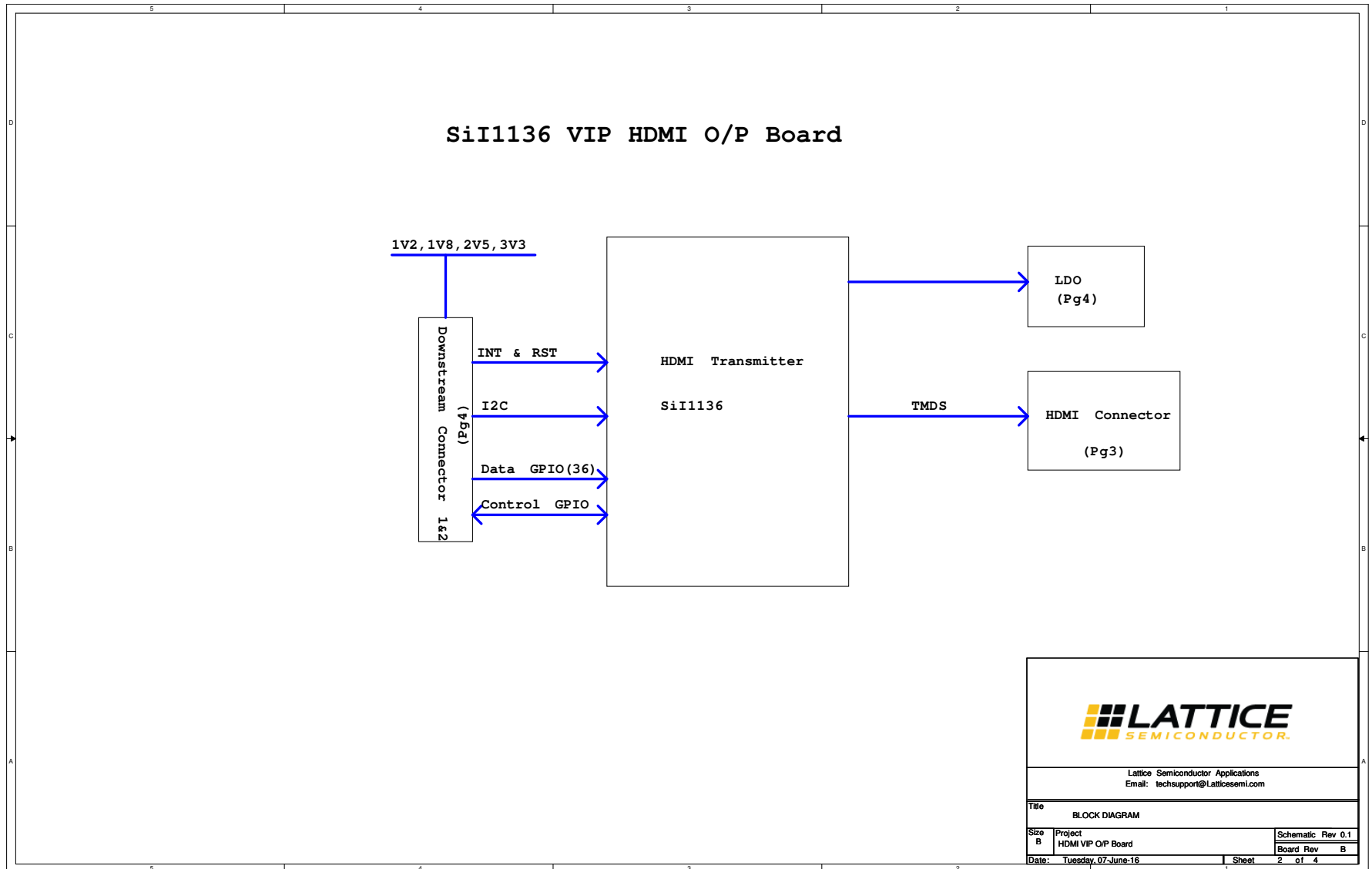


Figure A.1. Block Diagram

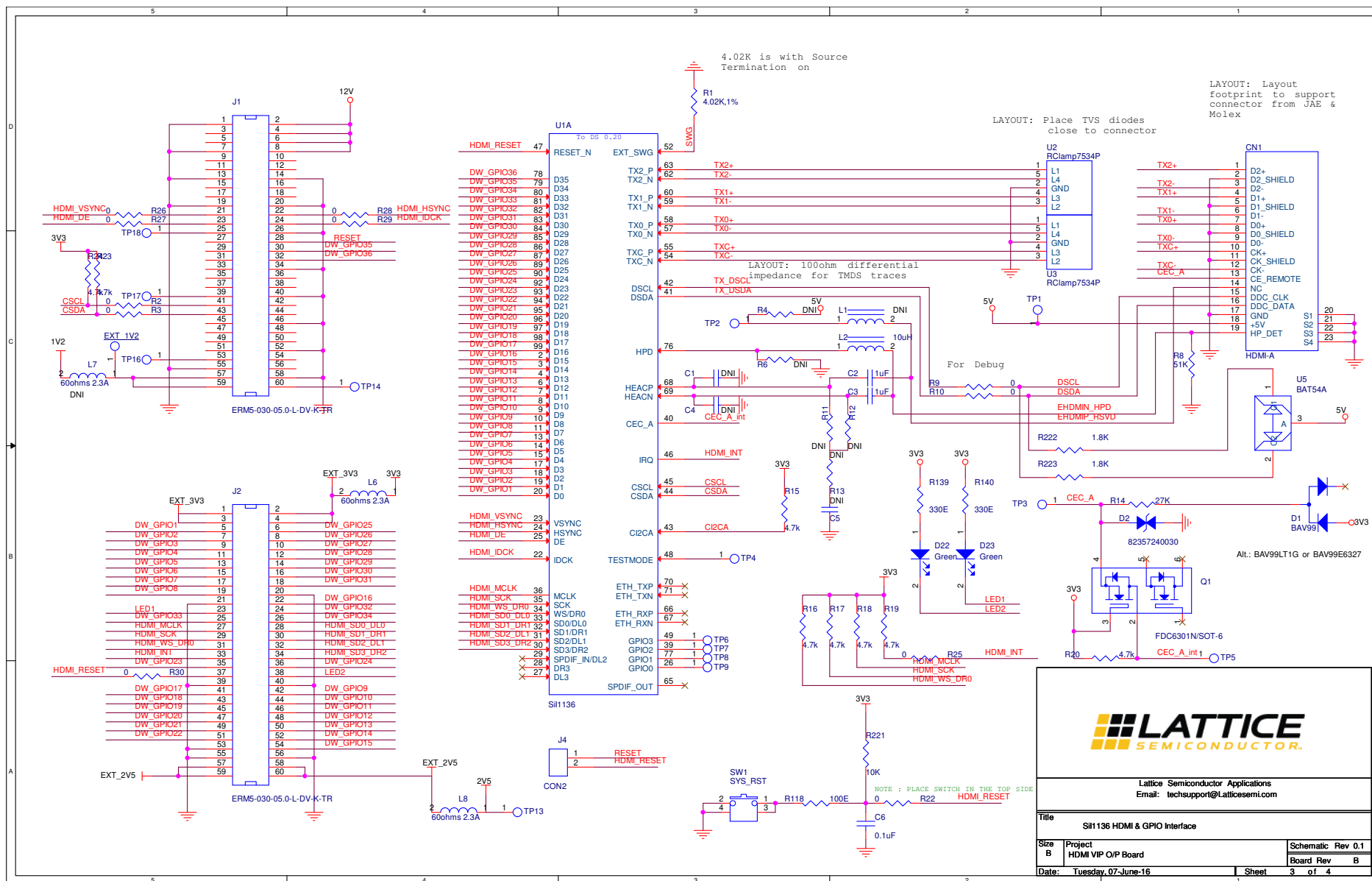


Figure A.2. Si1136 HDMI and GPIO Interface

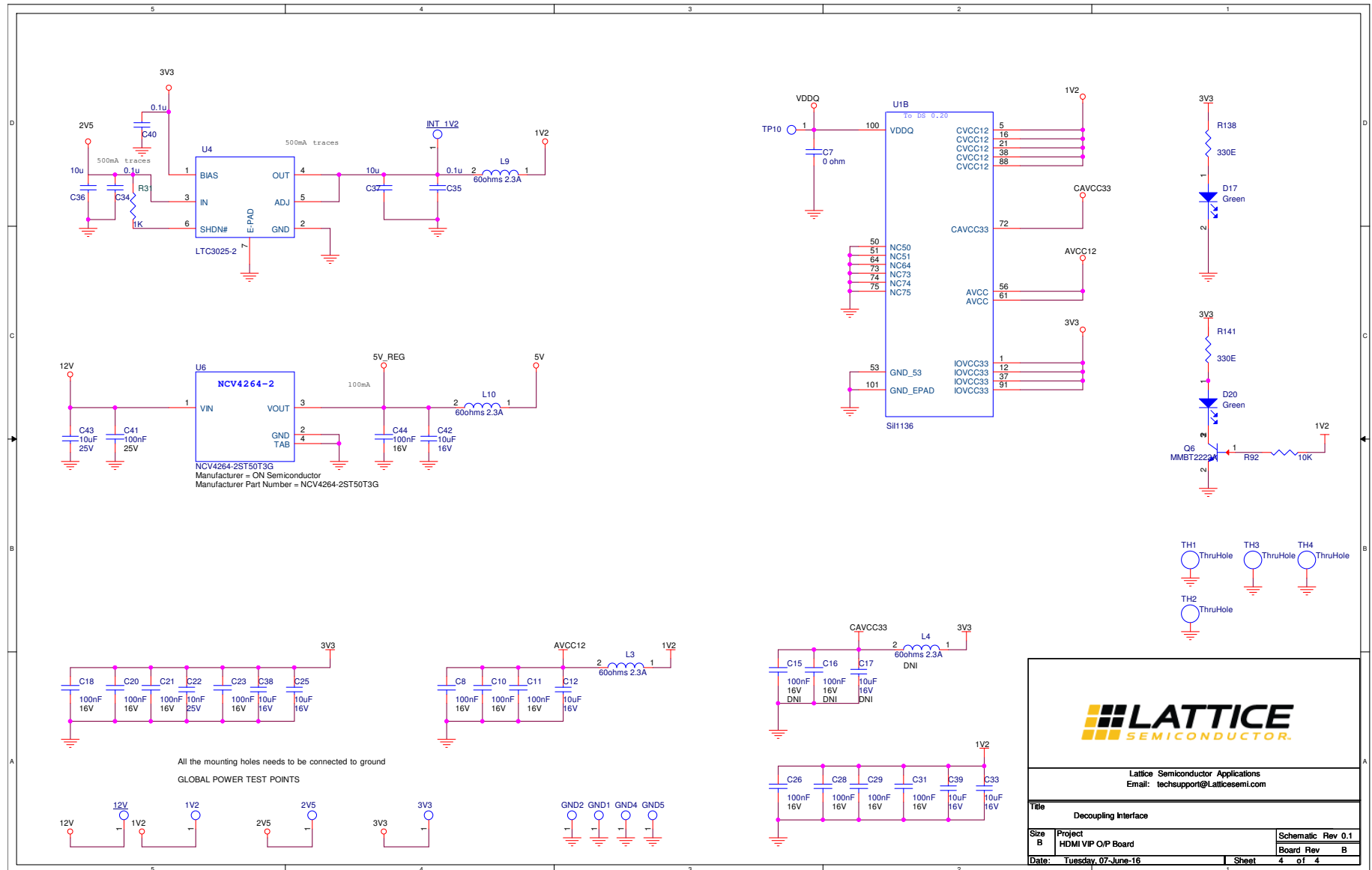


Figure A.3. Power Decoupling

Appendix B. HDMI VIP Output Bridge Board Bill of Materials

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
1	CN1	1	HDMI-A	I7446combi	—	685119134923	Würth	HDMI Type-A connector
2	C1, C4	2	C-0402_NP	402	DNL	885012205037	Würth	0402 NP Capacitor
3	C2, C3	2	1 μ F	603	—	885012106017	Würth	1 μ F Ceramic Chip Capacitor, X5R, 16 V
4	C5	1	C-0603_1U	603	DNL	885012106017	Würth	1 μ F Ceramic Chip Capacitor, X5R, 16 V
5	C6	1	0.1 μ F	C0402	—	885012205037	Würth	CAP CERAMIC 0.1 μ F 16 V X7R 0402
6	C7	1	0 Ω	603	—	RC0603JR-070RL	Yageo	Res 1/10 W 0.0 Ω 5% 0603
7	C8, C10, C11, C18, C20, C21, C23, C26, C28, C29, C31, C44	12	100 nF	C0402	—	885012205037	Würth	CAP CERAMIC 0.1 μ F 16 V X7R 0402
8	C15, C16	2	100 nF	C0402	DNL	885012205037	Würth	CAP CERAMIC 0.1 μ F 16 V X7R 0402
9	C12, C25, C33, C38, C39, C42	6	10 μ F	C1210	—	THJB106K016SJN	AVX	Tantalum Capacitors - Solid SMD 16 V 10 μ F 10%
10	C17	1	10 μ F	C1210	DNL	THJB106K016SJN	AVX	Tantalum Capacitors - Solid SMD 16 V 10 μ F 10%
11	C22	1	10 nF	C0402	—	885012205050	Würth	CAP 0.01 μ F 25 V CERAMIC X7R 0402
12	C34, C35, C40	3	0.1 μ F	C0402	—	CL05A104MP5NN NC	Samsung	Cap Ceramic 0.1 μ F 10 V X5R 20% SMD 0402 85C Paper T/R
13	C36, C37	2	10 μ F	C0603	—	CL10X106MP8NR NC	Samsung	CAP CER 10 μ F 10 V 20% X6S 0603
14	C41	1	100 nF	C0402	—	885012105018	Würth	CAP CER 0.1 μ F 25 V X5R 0402
15	C43	1	10 μ F	CT1210	—	TAJB106M025RNJ	AVX	Tantalum Capacitors - Solid SMD 25 V 10 μ F 20% Tol
16	D1	1	BAV99	SOT-23	—	BAV99	Fairchild Semiconductor Corporation	BAV99 Dual Series Diode, low leakage
17	D2	1	82357240030	402	—	82357240030	Würth	ESD Protection

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
18	D17, D20, D22, D23	4	Green	led_0603	—	150060VS75000	Würth	LED SUPER GREEN CLEAR 0603 SMD
19	GND1, GND2, GND4, GND5, INT_1V2, EXT_1V2, 1V2, 12V, 2V5, 3V3	10	TP_S_40_63	tp_s_40_63	DNL	—	—	Square test point, 40 mil inner diameter, 63 mil outer diameter
20	J1, J2	2	ERM5-030-05.0-L-DV-K-TR	ERM5-030-050-L-DV-K-TR	—	ERM5-030-05.0-L-DV-K-TR	Samtec Inc	Conn High Speed Edge Rate Terminal Strip HDR 60 POS 0.5 mm Solder ST SMD T/R -
21	J4	1	CON2	CON2	—	61300211121	Würth	2 Positions Header, Unshrouded Connector 0.100" (2.54 mm) Through Hole Gold
22	L1	1	L-1210_10U	74479888310	DNL	74479888310	Würth	10 μ H SMT Inductor
23	L2	1	10 μ H	74438336100	—	74438336100	Würth	10 μ H Unshielded Wirewound Inductor 900 mA 172.9 m Ω Max 1210 (3225 Metric)
24	L3, L6, L8, L9, L10	5	60 Ω 2.3 A	FB0603	—	742792602	Würth	EMI Filter Beads, Chips & Arrays 60 Ω Power
25	L4, L7	2	60 Ω 2.3 A	FB0603	DNL	742792602	Würth	EMI Filter Beads, Chips & Arrays 60 Ω Power
26	Q1	1	FDC6301N/SO T-6	SOT23-6	—	FDC6301N	Fairchild Semiconductor Corporation	N channel dual MOSFET
27	Q6	1	MMBT2222A	SM_SOT23-3	—	MMBT2222A,215	NXP Semiconductor	Bipolar Transistors - BJT NPN Gen Pur SS
28	R1	1	4.02K, 1%	603	—	ERJ-3EKF4021V	Panasonic	4.02K SMT Resistor 1% 1/10 W
29	R2, R3, R25, R26, R27, R28, R29	7	0	R0603	—	RC0603JR-070RL	Yageo	Res 1/10 W 0.0 Ω 5% 0603
30	R4, R6	2	R-0603_33K	603	DNL	RC0603JR-0733KL	Yageo America	33K SMT Resistor 5% 1/10 W

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
31	R8	1	51K	603	—	ERJ-3GEYJ513V	Panasonic	51K SMT Resistor 5% 1/10 W
32	R9, R10	2	0	603	—	RC0603JR-070RL	Yageo America	0R SMT Resistor 5% 1/10 W
33	R11, R12	2	R-0603_49_9T1	603	DNL	ERJ-3EKF49R9V	Panasonic	49.9 SMT Resistor 1% 1/10 W
34	R13	1	R-0603_0	603	DNL	RC0603JR-070RL	Yageo America	Res 1/10 W 0.0 Ohm 5% 0603
35	R14	1	27K	603	—	RC0603JR-0727KL	YAGEO Corporation	Res Thick Film 0603 27K Ω 5% 0.1 W (1/10 W) 100 ppm/C Molded SMD Paper T/R
36	R15, R16, R17, R18, R19, R20, R23, R24	8	4.7k	R0603	—	CRCW06034K70FK EA	Vishay	Thick Film Resistors - SMD 1/10 W 4.7K Ω 1%
37	R22, R30	2	0	R0402	—	RC0402JR-070RL	Yageo	Res 1/16 W 0.0 Ω 5% 0402
38	R31	1	1K	R0402	—	RMCF0402JT1K00	Stackpole Electronics Inc	RES 1K Ω 1/16 W 5% 0402
39	R92	1	10K	R0402	—	ERJ-2GEJ103X	Panasonic	RES SMD 10K Ω 1% 1/10 W 0402
40	R118	1	100E	R0402	—	TNPW0402100RB EED	Vishay	Thin Film Resistors - SMD 100 Ω 0.1% 25 ppm
41	R138, R139, R140, R141	4	330E	R0402	—	CRCW0402330RFB ED	Vishay / Dale	Thick Film Resistors - SMD 1/16 W 330 Ω 1%
42	R221	1	10K	R0402	—	RMCF0402JT10K0	Stackpole Electronics Inc	RES 10K Ω 1/16 W 5% 0402
43	R222, R223	2	1.8K	603	—	RC0603JR-071K8L	Yageo America	1.8K SMT Resistor 5% 1/10 W
44	SW1	1	SYS_RST	4psmd_switch	—	434153017835	Würth	SWITCH TACTILE SPST-NO 0.05 A 12 V
45	TH1, TH2, TH3, TH4	4	ThruHole	MTG125	DNL	—	—	—

Item	Reference	Qty	Part	PCB Footprint	Comments	Part Number	Manufacturer	Description
46	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP13, TP14, TP16, TP17, TP18	15	TEST POINT	TH	—	22-28-4020	Molex	Test Point 0.1"
47	U1	1	SiI1136	TQFP-100	—	SiI1136	Lattice Semiconductor	SiI1136 HDMI Transmitter
48	U2, U3	2	RClamp7534P	RClamp7534P	—	RClamp7534P	Semtech Corporation	Ultra Low Capacitance RClamp
49	U4	1	LTC3025-2	LTC3025-DFN	—	LTC3025EDC-2#TRMPBF	Linear Tech	LDO Regulator Pos 1.2 V 0.5 A 6-Pin DFN EP T/R
50	U5	1	BAT54A	BAT54A	—	BAT54A,235	NXP Semiconductors	Diode Schottky 30 V 0.2 A
51	U6	1	NCV4264-2ST50T3G	NCV4264_SOT 223	—	NCV4264-2ST50T3G	ON Semiconductor	IC REG LDO 5 V 0.1 A SOT223
52	HDMI Video Processing Output Board REV B PCB	1	—	—	—	305-PD-17-0066	PACTRON	—

Revision History

Date	Version	Change Summary
June 2017	1.1	Updated Ordering Information section.
April 2017	1.0	Initial release.



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