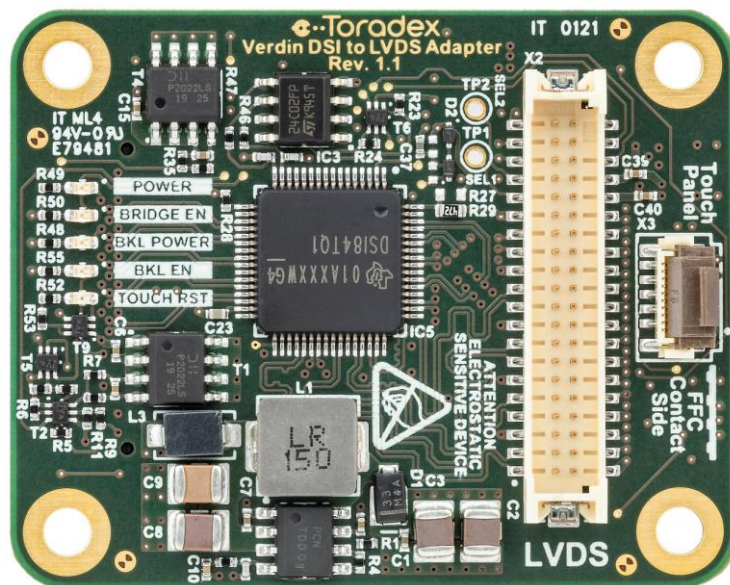


Toradex DSI to LVDS Adapter

Datasheet



Revision History

Date	Doc. Rev.	Board Version	Changes
12-May-21	Rev. 1.00	V1.1	Initial document release.
2-Dec-24	Rev. 1.01	V1.1	Rename the product from "Verdin DSI to LVDS Adapter" to "Toradex DSI to LVDS Adapter"

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1. Introduction

The Toradex DSI to LVDS Adapter is an add-on board for the Verdin Development Board which uses a MIPI-DSI Interface to provide an LVDS data output.

The Toradex DSI to LVDS Adapter uses Texas Instruments SN65DSI84-Q1 DSI to Single/Dual-Channel LVDS Bridge. It features a Single-Channel MIPI® D-PHY receiver front-end configuration with 4 data lanes per channel operating at 1Gbps per data lane and a maximum input bandwidth of 4Gbps.

The bridge decodes MIPI® DSI 18-bpp RGB666 and 24-bpp RGB888 packets and converts the formatted video data-stream to an LVDS output operating at pixel clocks range from 25 MHz to 154 MHz, offering a Dual-Channel LVDS or Single-Channel LVDS with four data lanes per channel. It is well suited for WUXGA (1920 x 1080) at 60 frames per second (fps) with up to 24 bits-per-pixel (bpp).

The Toradex DSI to LVDS Adapter can be connected to the MIPI® DSI connector on the related connector on supported carrier boards.

1.1. Reference Documents

For detailed technical information on the suitable computer modules and other reference documents, please refer to the following sections:

1.1.1 Verdin Development Board V1.1 Datasheet

https://docs.toradex.com/109463-verdin_development_board_datasheet_v1.1.pdf

1.1.2 Aquila Development Board

<https://developer.toradex.com/hardware/aquila-som-family/carrier-boards/aquila-development-board>

1.1.3 Dahlia Carrier Board V1.1 Datasheet

https://docs1.toradex.com/109590-dahlia_datasheet_v1.1.pdf

1.1.4 Toradex 10.1inch LVDS Capacitive Touch Display Datasheet

<https://docs.toradex.com/105952-10-1-inch-lvds-capacitive-touch-display-1280x800-datasheet.pdf>

1.1.5 Toradex Developer Website

<http://developer.toradex.com/>

1.1.6 SN65DSI84-Q1 MIPI® DSI to Dual-Link LVDS Bridge Product Datasheet

<http://www.ti.com/lit/ds/symlink/sn65dsi84-q1.pdf>

2. Features

2.1. One-Channel MIPI® DSI Receiver

- Implements MIPI D-PHY version 1.00.00 Physical Layer Front-end and DSI version 1.02.00
- Single-Channel DSI Receiver configurable for one, two, three, or four D-PHY data lanes per channel operating up to 1 Gbps per lane
- Supports 18-bpp and 24-bpp DSI Video Packets with RGB666 and RGB888 Formats

2.2. LVDS Transmitter

- Suitable for 60-fps WUXGA 1920 x 1200 resolution at 18-bpp and 24-bpp color (Dual-Channel LVDS), and 60-fps 1366 x 768 resolution at 18-bpp and 24-bpp (Single-Channel LVDS)
- Output Configurable for Single-Channel or Dual-Channel LVDS
- Supports Single-Channel DSI to Dual-Channel LVDS operating mode
- LVDS Output-Clock Range of 25 MHz to 154 MHz in Dual-Channel or Single-Channel mode
- LVDS Channel SWAP, LVDS PIN Order Reverse feature for ease of PCB routing

2.3. Hardware Architecture Block Diagram

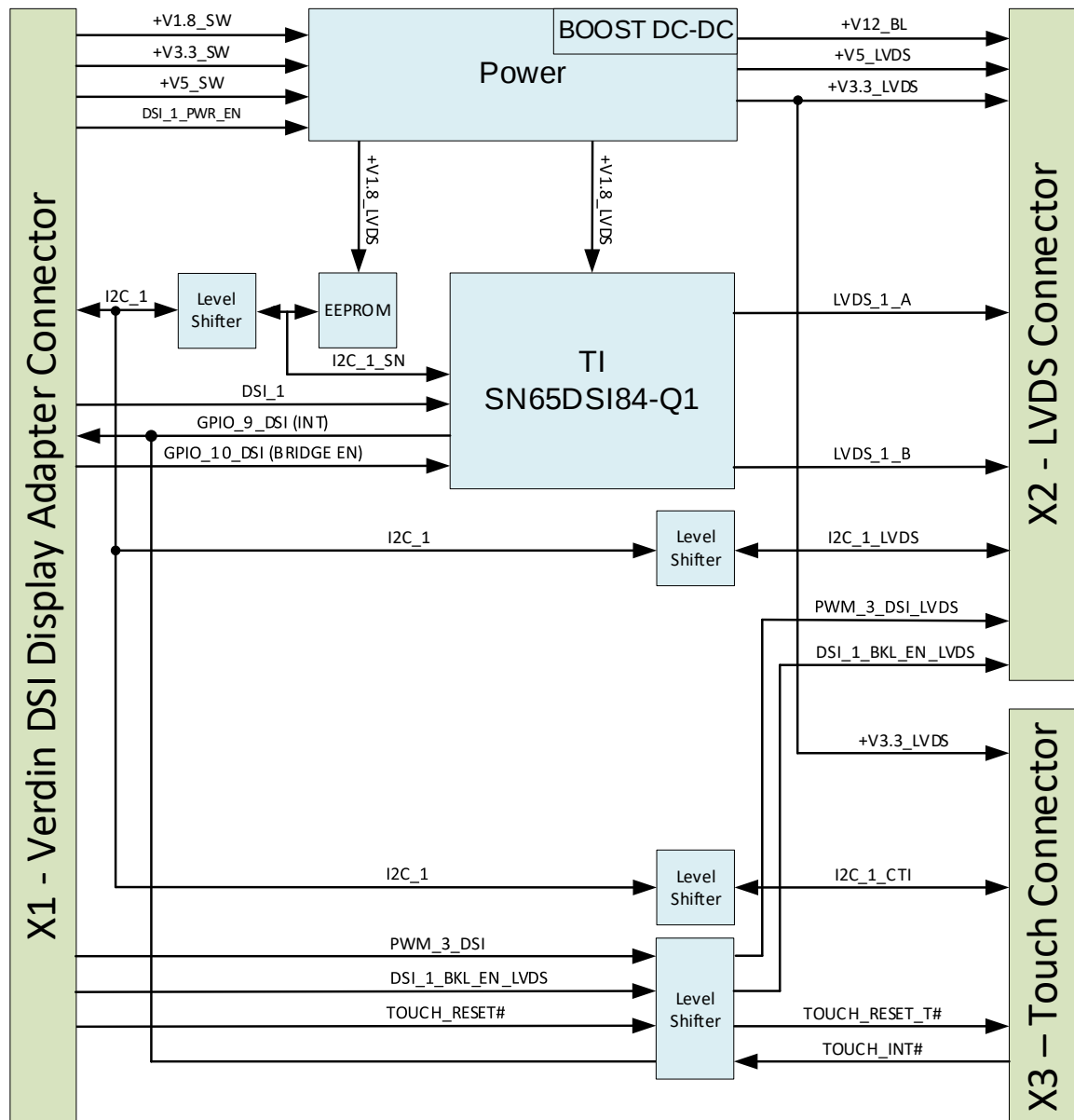


Fig.1 Toradex DSI to LVDS Adapter Hardware Architecture

2.4. Physical Drawings

2.4.1 Top Side Connectors

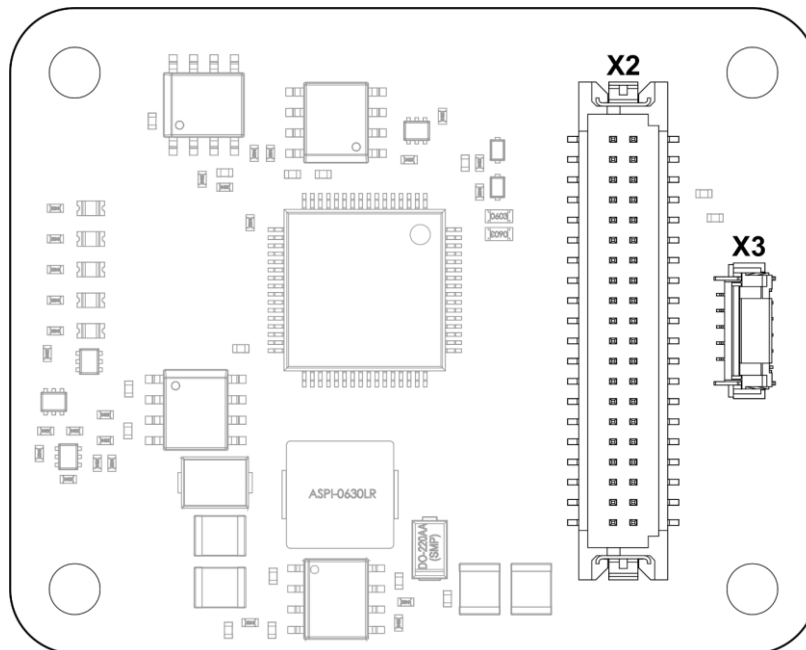


Fig.2 Toradex DSI to LVDS Adapter – Top Side

2.4.2 Bottom Side Connector

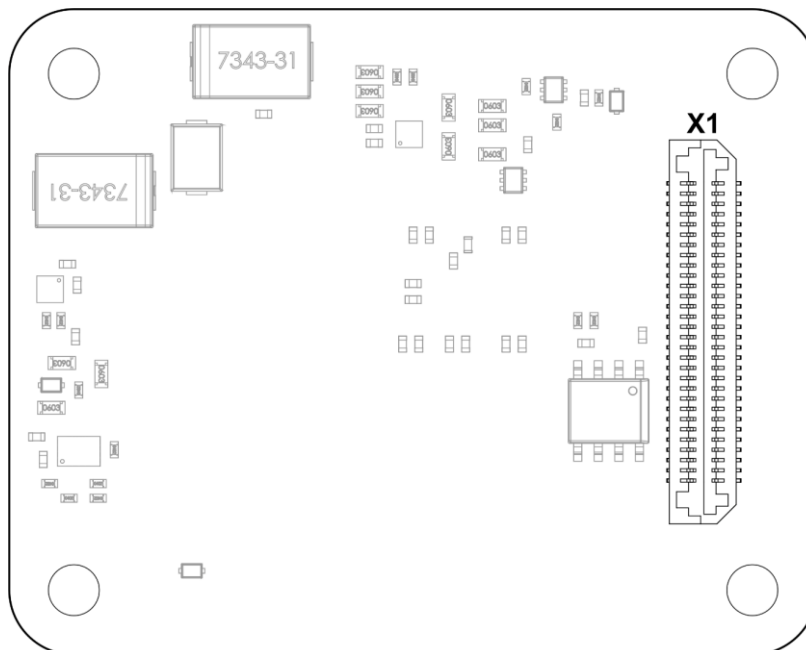


Fig.3 Toradex DSI to LVDS Adapter – Bottom Side

Ref	Description	Remarks
X1	Verdin DSI Display Adapter Connector	
X2	LVDS Connector	
X3	Capacitive Touch Panel Connector	

2.4.3 Hardware Setup

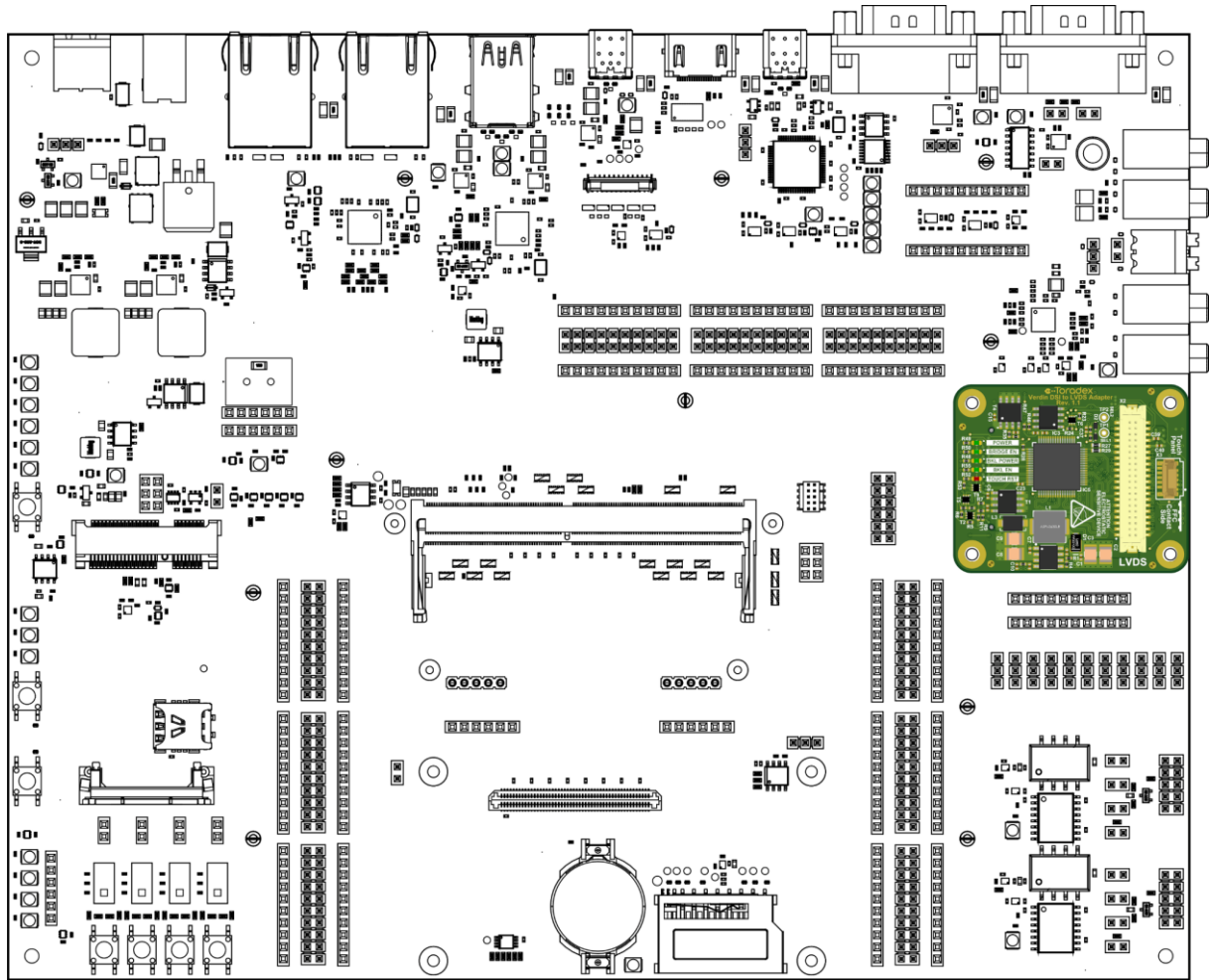


Fig.4 Toradex DSI to LVDS Adapter – installed on the Verdin Development Board

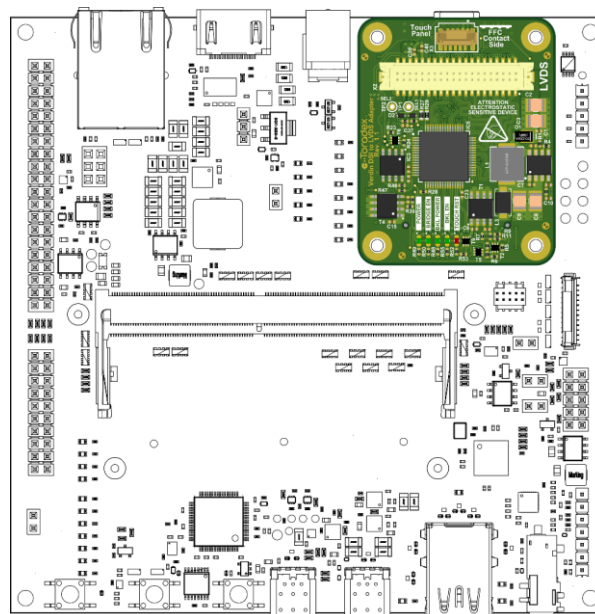


Fig.5 Toradex DSI to LVDS Adapter – installed on the Dahlia Carrier Board

3. Interface Description

3.1. DSI Display Adapter Connector (X1)

Manufacturer: Samtec LSS-130-03-L-DV-A-K-TR

Type: High-Speed Socket

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down	Description
1	NC				Not connected
3	GND	PWR			
5	NC				Not connected
7	NC				
9	NC				
11	NC				
13	NC				
15	NC				
17	NC				
19	+V5_SW	PWR	+5V		+5V power supply input
21	+V5_SW	PWR	+5V		
23	+V5_SW	PWR	+5V		
25	+V5_SW	PWR	+5V		
27	+V5_SW	PWR	+5V		
29	NC				Not connected
31	+V3.3_SW	PWR	+3.3V		+3.3V power supply input
33	+V3.3_SW	PWR	+3.3V		
35	+V3.3_SW	PWR	+3.3V		
37	+V3.3_SW	PWR	+3.3V		
39	+V3.3_SW	PWR	+3.3V		
41	NC				Not connected
43	+V1.8_SW	PWR	+1.8V		+1.8V power supply input
45	+V1.8_SW	PWR	+1.8V		
47	+V1.8_SW	PWR	+1.8V		
49	+V1.8_SW	PWR	+1.8V		
51	+V1.8_SW	PWR	+1.8V		
53	NC				Not connected
55	GND	PWR			
57	NC				Not connected
59	DSI_1_PWR_EN	I	+1.8V	34k to GND	Enable LVDS Adapter power supply.
2	NC				Not connected
4	I2C_1_SDA	I/O	+1.8V	on a carrier board	I ² C interface, used for LVDS bridge IC configuration and communicating with EEPROM, display, touchscreen.
6	I2C_1_SCL	I	+1.8V	on a carrier board	
8	GPIO_9_DSI	O(OD)	+1.8V	4.7k to +V1.8_SW	Interrupt signal output with an open drain.
10	GND	PWR			
12	DSI_1_D0_P	I/O			DSI Interface data lane 0
14	DSI_1_D0_N	I/O			
16	GND	PWR			

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down	Description
18	DSI_1_D1_P	I			DSI Interface data lane 1
20	DSI_1_D1_N	I			
22	GND	PWR			
24	DSI_1_CLK_P	I			DSI Interface clock
26	DSI_1_CLK_N	I			
28	GND	PWR			
30	DSI_1_D2_P	I			DSI Interface data lane 2
32	DSI_1_D2_N	I			
34	GND	PWR			
36	DSI_1_D3_P	I			DSI Interface data lane 3
38	DSI_1_D3_N	I			
40	GND	PWR			
42	TOUCH_RESET#	I	+1.8V	100k to +V1.8_SW	Touchscreen controller RESET input
44	NC				Not connected
46	DSI_1_BKL_EN	I	+1.8V	100k to GND	Display backlight ENABLE input
48	NC				Not connected
50	GND	PWR			
52	NC				Not connected
54	NC				
56	GPIO_10_DSI	I	+1.8V		LVDS bridge IC ENABLE/RESET input
58	PWM_3_DSI	I	+1.8V	10k to +V1.8_SW	Display brightness control input
60	GND	PWR			

3.2. LVDS Connector (X2)

Manufacturer: Hirose DF13EA-40DP-1.25V(76)

Type: Header connector

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down	Description
1	LVDS_1_A_TX3_P	O			LVDS data lane 3 for channel A
2	GND	PWR			
3	LVDS_1_A_TX3_N	O			LVDS data lane 3 for channel A
4	LVDS_1_B_CLK_N	O			LVDS clock for channel B
5	GND	PWR			
6	LVDS_1_B_CLK_P	O			LVDS clock for channel B
7	LVDS_1_A_TX2_P	O			LVDS data lane 2 for channel A
8	GND	PWR			
9	LVDS_1_A_TX2_N	O			LVDS data lane 2 for channel A
10	LVDS_1_B_TX0_N	O			LVDS data lane 0 for channel B
11	GND	PWR			
12	LVDS_1_B_TX0_P	O			LVDS data lane 0 for channel B
13	LVDS_1_A_TX1_P	O			LVDS data lane 1 for channel A
14	GND	PWR			
15	LVDS_1_A_TX1_N	O			LVDS data lane 1 for channel A
16	LVDS_1_B_TX1_N	O			LVDS data lane 1 for channel B
17	GND	PWR			
18	LVDS_1_B_TX1_P	O			LVDS data lane 1 for channel B
19	LVDS_1_A_TX0_P	O			LVDS data lane 0 for channel A
20	GND	PWR			
21	LVDS_1_A_TX0_N	O			LVDS data lane 0 for channel A
22	LVDS_1_B_TX2_N	O			LVDS data lane 2 for channel B
23	GND	PWR			
24	LVDS_1_B_TX2_P	O			LVDS data lane 2 for channel B
25	LVDS_1_A_CLK_P	O			LVDS clock for channel A
26	GND	PWR			
27	LVDS_1_A_CLK_N	O			LVDS clock for channel A
28	LVDS_1_B_TX3_N	O			LVDS data lane 3 for channel B
29	GND	PWR			
30	LVDS_1_B_TX3_P	O			LVDS data lane 3 for channel B
31	RESERVED (SEL1)				Not connected (0R resistor not assembled)
32	+V3.3_LVDS	PWR	+3.3V		LVDS display power output
33	RESERVED (SEL2)				Not connected (0R resistor not assembled)
34	+V5_LVDS	PWR	+5V		LVDS display power output
35	PWM_3_DSI_LVDS	O	+3.3V		Display brightness control output ¹
36	I2C_1_LVDS_SDA	I/O	+3.3V	4.7k to +V3.3_LVDS	I ² C interface for configuring LVDS display
37	DSI_1_BKL_EN_LVDS	O	+3.3V		Display backlight ENABLE output
38	I2C_1_LVDS_SCL	O	+3.3V	4.7k to +V3.3_LVDS	I ² C interface for configuring LVDS display
39	+V12_BL	PWR	+12V		Display backlight power output
40	+V12_BL	PWR	+12V		

1: Backlight Brightness = 100% if PWM = 0. Backlight Brightness = 0% if PWM = 100%

3.3. Capacitive Touch Connector (X3)

Manufacturer: Hirose FH12-10S-0.5SVA(54)

Type: Receptacle FPC/FFC connector

Pin	Signal Name	I/O Type	Voltage	Pull-up/Pull-down	Description
1	I2C_1_CTI_SDA	I/O	+3.3V	4.7k to +V3.3_LVDS	I ² C interface, used for communicating with the capacitive touchscreen controller
2	I2C_1_CTI_SCL	O	+3.3V	4.7k to +V3.3_LVDS	
3	GND	PWR			
4	TOUCH_INT#	I	+3.3V	100k to +V3.3_LVDS	Touchscreen controller interrupt input
5	TOUCH_RESET_T#	O	+3.3V		Touchscreen controller RESET output
6	+V3.3_LVDS	PWR	+3.3V		Touchscreen controller power output
7	NC				Not connected
8	NC				
9	NC				
10	NC				

3.4. LED Indications

The Toradex DSI to LVDS Adapter board features 5 LEDs. These LEDs show the status of the power supply and an important control signals.

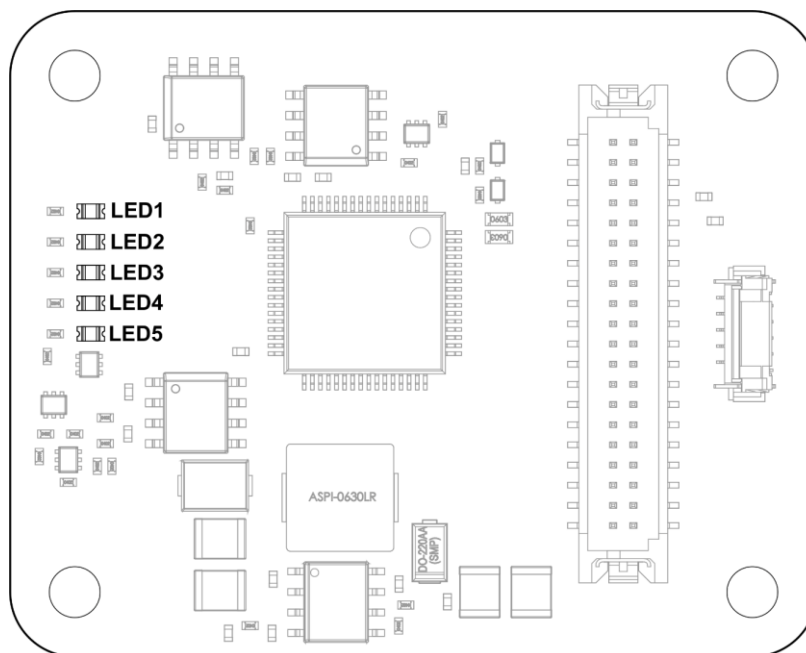


Fig.6 Toradex DSI to LVDS Adapter LEDs

The LEDs and their functions are listed below.

Designator	Silkscreen name	Description
LED1	POWER	LED is lit when adapter board power is enabled
LED2	BRIDGE EN	LED is lit when DSI to LVDS bridge IC5 is enabled
LED3	BKL POWER	LED is lit when DC-DC converter 12V output for powering display backlight is available
LED4	BKL EN	LED is lit when LVDS display backlight is enabled
LED5	TOUCH RST	LED is lit when LVDS display touch controller is in a "RESET" state

3.5. Test Points

The Toradex DSI to LVDS Adapter board features 2 test points to provide an access to the important signals.

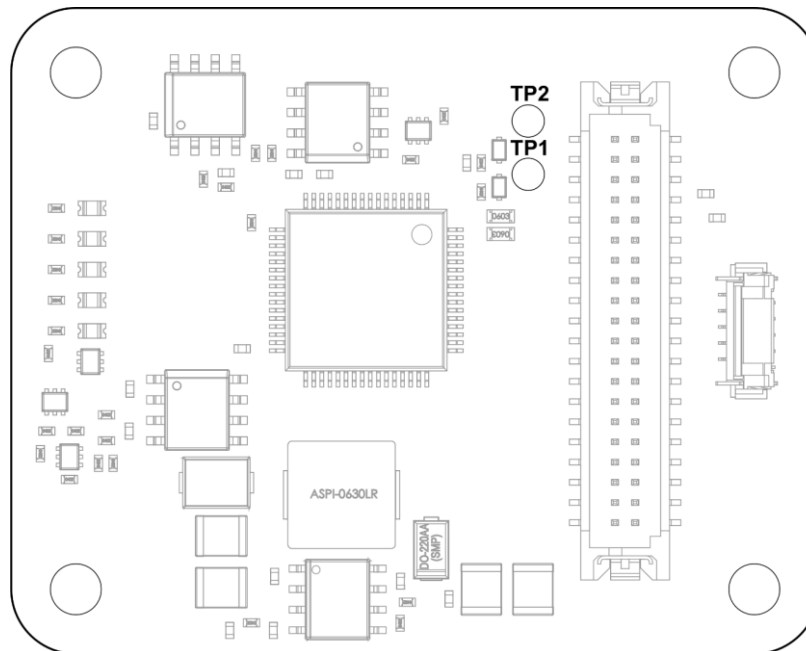


Fig7. Toradex DSI to LVDS Adapter Test Points

The LEDs and their functions are listed below.

Designator	Description
TP1	Connected to the TOUCH_INT# through the R30. R30 is not assembled. Reserved for future displays.
TP2	Connected to the TOUCH_RESET_T# through the R31. R31 is not assembled. Reserved for future displays.

4. Electrical Characteristics

4.1. Power Supply Characteristics

4.1.1 Supply Voltage

Parameter	Min.	Typ.	Max.	Unit
+V1.8_SW Supply Voltage	1.65	1.8	1.95	V
+V3.3_SW Supply Voltage	3.0	3.3	3.5	V
+V5_SW Supply Voltage (not used)		-		V
+V_SUPPLY_FILT_SW Supply Voltage (not used)		-		V

4.1.2 Current Consumption

Parameter	Conditions	Typ. Supply Current	Unit
+V1.8_SW Supply Voltage	SN65DSI84: SINGLE Channel DSI to DUAL Channel LVDS, 1440 x 900 (T _{amb} = 25°C)	108	mA
+V3.3_SW Supply Voltage	(T _{amb} = 25°C) Without display	6	mA
+V3.3_SW Supply Voltage	(T _{amb} = 25°C) With Toradex 10.1inch LVDS display	2.24	A

4.1.3 Backlight BOOST DC-DC converter

Parameter	Min.	Typ.	Max.	Unit
Output Voltage (T _{amb} = 25°C)	-	12	-	V
Output Current (T _{amb} = 25°C)	-	-	600	mA

5. Operating Conditions

5.1. Operating Temperature Range

- -30 to +85 °C

6. Mechanical Data

6.1. Toradex DSI to LVDS Adapter Dimensions

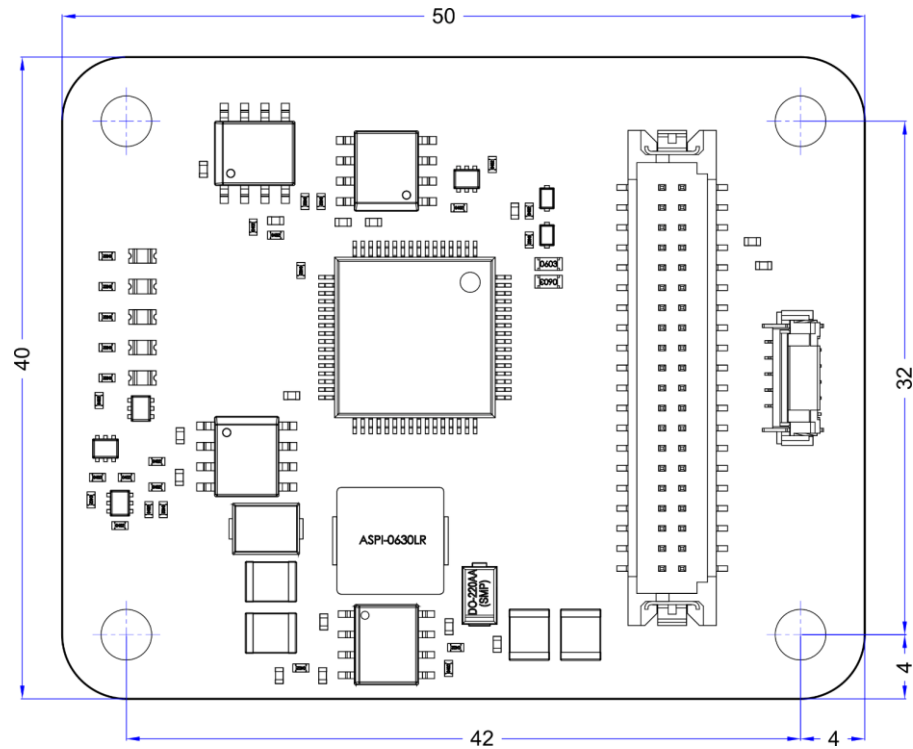


Fig.8 Toradex DSI to LVDS Adapter Dimensions (mm) – top side, top view

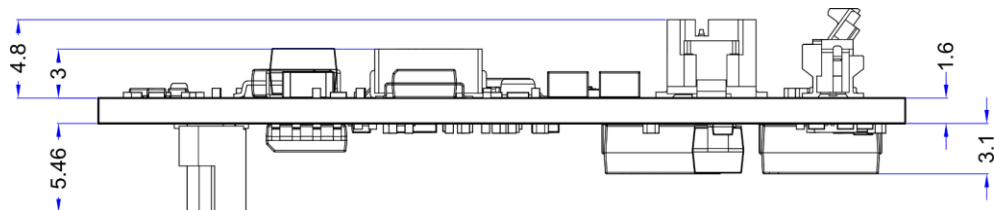


Fig.9 Toradex DSI to LVDS Adapter Dimensions (mm) – side 1, side 1 view

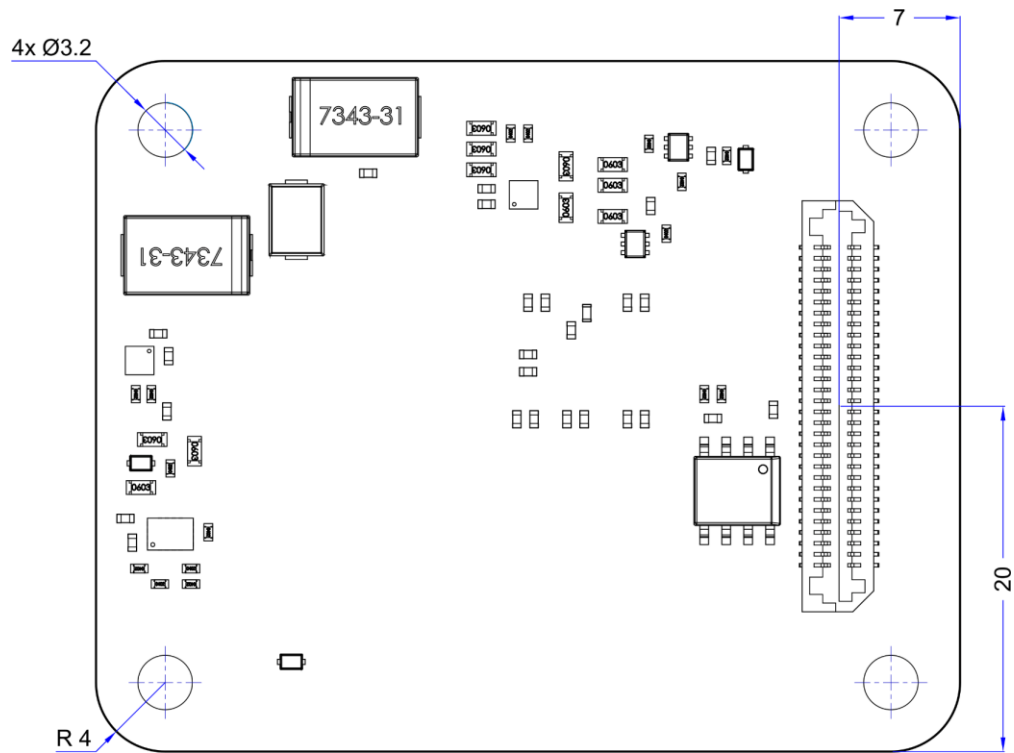


Fig.10 Toradex DSI to LVDS Adapter Dimensions (mm) - bottom side, bottom view

7. Design Data

The design data for the Toradex carrier boards and adapter boards are freely available in the Altium Designer format. The design data includes schematics, layout, and component libraries.

To download the board design data, please use the link below:

<http://developer.toradex.com/carrier-board-design/reference-designs>

8. Product Compliance

Up-to-date information about product compliance such as RoHS, CE, UL-94, Conflict Mineral, REACH etc. can be found on our website at: <http://www.toradex.com/support/product-compliance>

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