



DLP® LightCommander™ Controller Board

Hardware Specification

Hardware Documentation

Logic // Products
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Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
1	RL, JCA	Initial release	KTL	04/15/10

Table of Contents

1	Introduction	1
2	Controller Board Overview	1
2.1	Controller Board Block Diagram	1
2.2	DLPC200 Controller Chip Overview	1
2.3	DLPA200 DMD Analog Drive	2
2.4	DLPR200 Configuration PROM Overview	2
3	Controller Board Operating Conditions	2
3.1	Input Operating Conditions	2
3.2	Environmental Specifications.....	2
4	Electrical Specifications	2
4.1	Resets	2
4.1.1	GLOBAL_nRST	2
4.1.2	PWR_GOOD	3
4.2	Power Sequencing	3
4.2.1	Power-up Order	3
4.2.2	Power-down Order	4
5	Connector Specifications	4
5.1	HDMI Connector	4
5.2	Sync Signal Connectors.....	4
5.3	Edge-Card Connector (DMD Board Connector).....	4
5.4	USB Connector	5
5.5	DC Power Input.....	5
5.6	Internal Expansion Connectors.....	5
5.7	LED Drive Connector	8
5.8	Fan/Aux Power Connectors	9
6	Mechanical Specifications	10
6.1	Mechanical Characteristics of Controller Board.....	10
7	Controller Board Mechanical Drawings	11

1 Introduction

The DLP LightCommander is a modular development kit that provides users the ability to optimize components to create a development experience best suited for their application needs. One of those components is the controller board that contains the DLPC200 controller chip and DLPA200 DMD analog driver. This Hardware Specification provides the technical details of the controller board.

2 Controller Board Overview

2.1 Controller Board Block Diagram

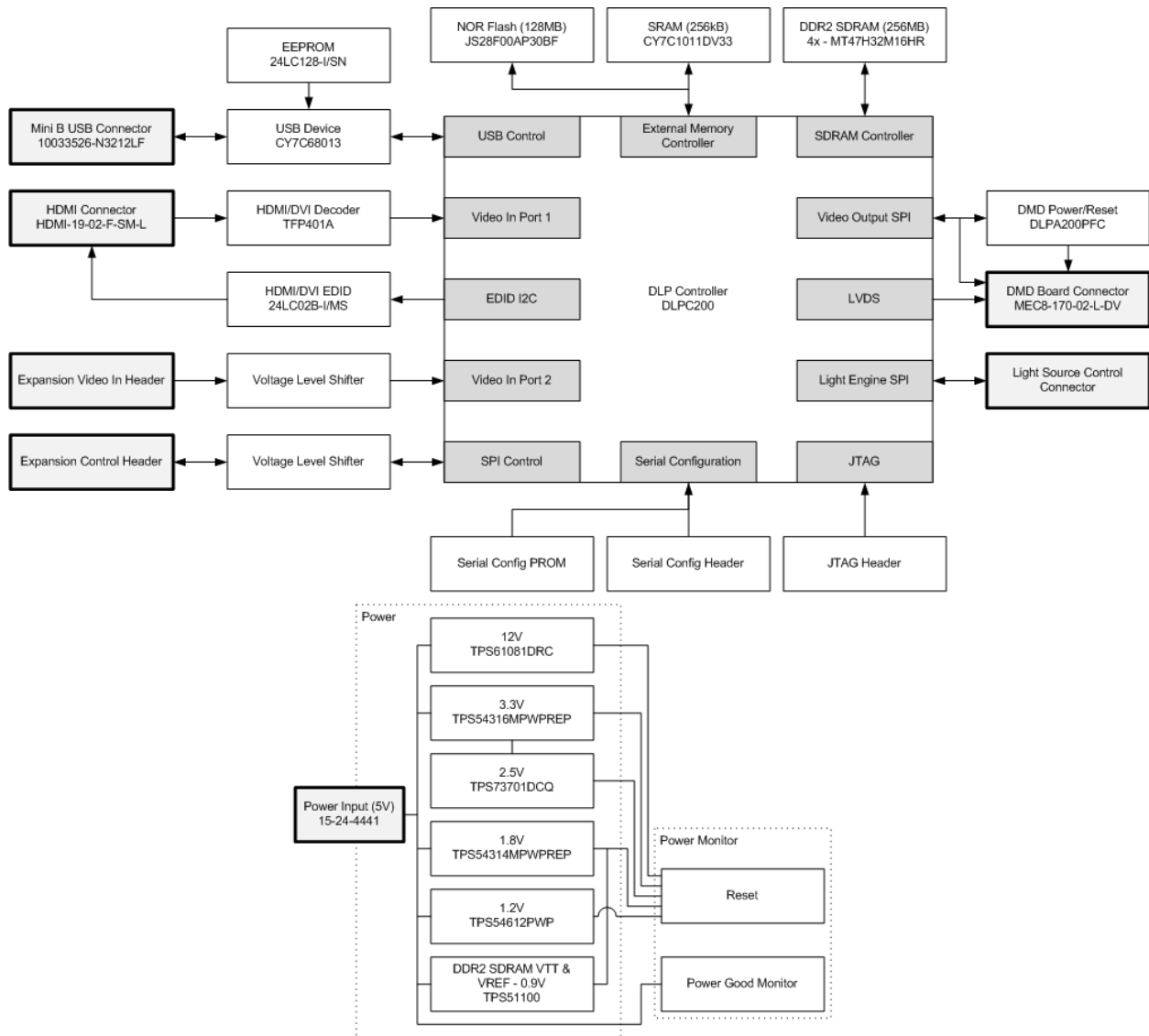


Figure 2.1: Controller Board Block Diagram

2.2 DLPC200 Controller Chip Overview

The DLPC200 performs all the image processing and control, along with DMD data formatting, for driving a 0.55 XGA DMD (DLP5500).

More details pertaining to the DLPC200 can be found in TI documentation on the DLPC200 product page: www.ti.com search for “DLPC200.”

2.3 DLPA200 DMD Analog Drive

The DLPA200 is controlled by the DLPC200 controller chip and is used to clock the DLP5500 mirrors.

More details pertaining to the DLPA200 can be found in TI documentation on the DLPC200 product page: www.ti.com search for “DLPC200.”

2.4 DLPR200 Configuration PROM Overview

The DLPR200 is downloadable PROM code for the 0.55 XGA chipset and is written to work in conjunction with the DLPC200 and DLP5500.

The download file is located on the DLPC200 product page: www.ti.com search for “DLPC200.”

3 Controller Board Operating Conditions

3.1 Input Operating Conditions

The stress ratings in the table below are only for transient conditions. Operation at, or beyond, absolute maximum ratings conditions may affect reliability and cause permanent damage to the board and its components.

Table 3.1: Input Operating Conditions

Parameter	Min	Typical	Max	Unit	Notes
Input Voltage	4.8	5	5.25	V	1
Input Current	—		7	A	

Notes:

1. All voltages given with respect to DGND

3.2 Environmental Specifications

Table 3.2: Environmental Specifications

Parameter	Min	Max	Unit
Operating Temperature	0	70	°C
Storage Temperature	-40	80	°C

4 Electrical Specifications

4.1 Resets

4.1.1 GLOBAL_nRST

The GLOBAL_nRST signal is connected to a physical button that can be pressed to force a system reset. This signal can be asserted by the controller board or it can be asserted externally through the hardware reset button (S3).

This active-low signal is monitored onboard and is allowed to go high when all voltage rails on the board are within the valid operating range and the DLPC200 is configured. The rails monitored by this signal are VCC_1P2V, VCC_12V, VCC_3P3V, VCC_1P8V, and VCC_2P5V.

4.1.2 PWR_GOOD

The PWR_GOOD signal is an output only from the reset monitor. This active-low signal indicates that the input power to the board (VCC_5P0V) is valid and can provide early warning that system power is being removed. This signal will not release on power-up until GLOBAL_nRST releases.

4.2 Power Sequencing

4.2.1 Power-up Order

1. VCC_5P0V applied
2. VCC_1P2V, VREF_B2, VREF_B3_B4, VTT_B2, VTT_B3_B4, VCC_12V
3. VCC_3P3V, VCC_1P8V
4. VCC_2P5V
5. GLOBAL_nRST releases
6. PWR_GOOD releases

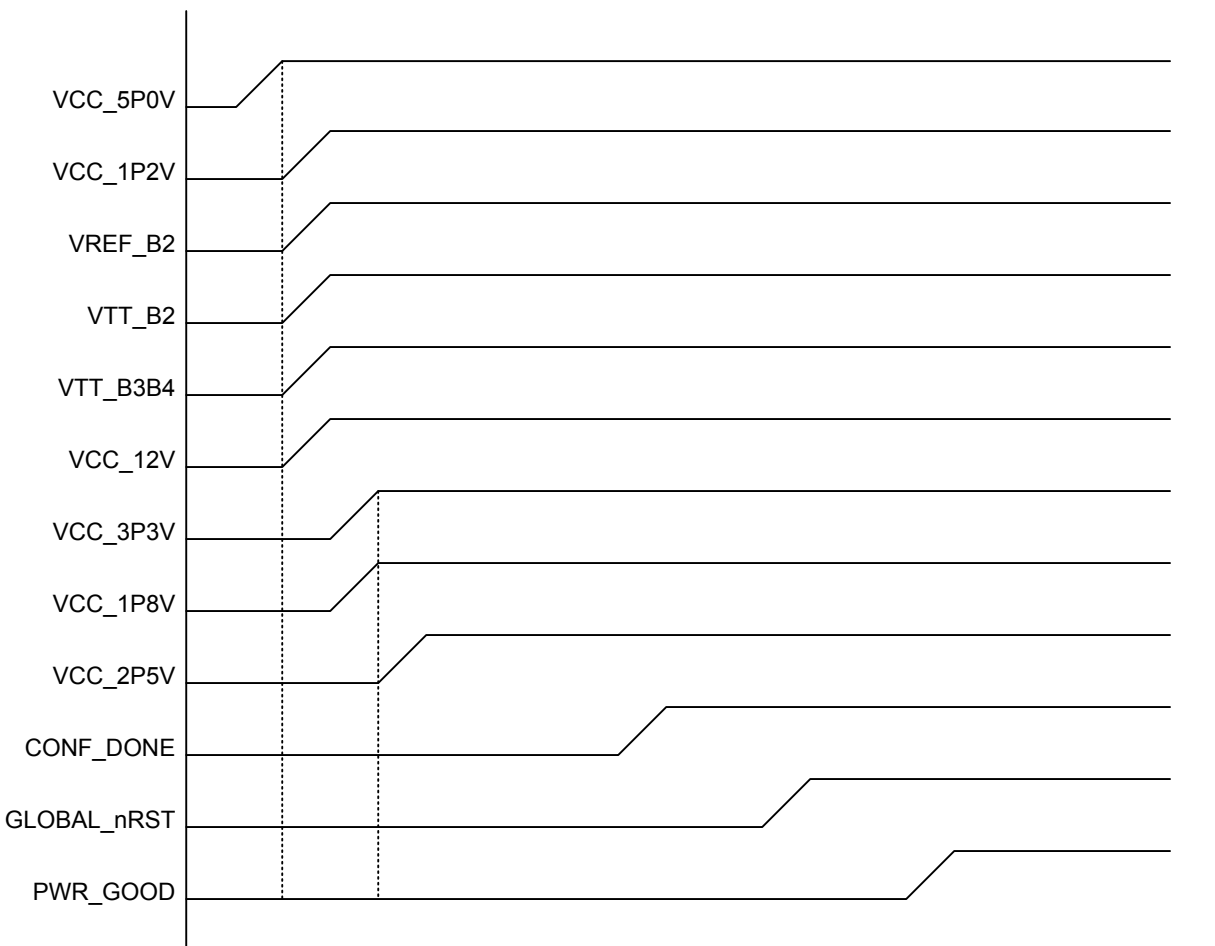


Figure 4.1: Power-up Sequencing Diagram

4.2.2 Power-down Order

1. VCC_5P0V removed
2. PWR_GOOD deasserts
3. All rails decay

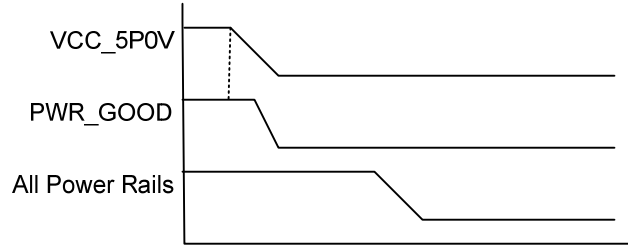


Figure 4.2: Power-down Sequencing Diagram

5 Connector Specifications

5.1 HDMI Connector

An HDMI connector provides video input to the LightCommander unit; this connection is video-only and does not support audio or encrypted video. The HDMI connector datasheet can be found on Samtec’s website.

Table 5.1: HDMI Connector Information

Ref. Designator	Manufacturer	Connector P/N	Product Webpage
P1	Samtec	HDMI-19-01-F-SM-L	www.samtec.com/ProductInformation/TechnicalSpecifications/Overview.aspx?series=HDMI

5.2 Sync Signal Connectors

Three user sync signal connectors provide communications to the controller board. The connectors are RF/coaxial with the shield tied to DGND and the center pin tied to the DLPC200.

Table 5.2: Sync Signal Connector Information

Ref. Designator	Manufacturer	Connector P/N	Product Webpage
J28, J29, J30	Molex	73138-5033	www.molex.com/molex/products/datasheet.jsp?part=active/0731385033_RF_COAX_CONNECTORS.xml&channel=Products&Lang=en-US

5.3 Edge-Card Connector (DMD Board Connector)

The controller board features a connector to interface with the DMD board’s gold-plated card edge; this connector is a Samtec mini edge-card socket. Samtec provides mechanical drawings of the surface mount footprint for this connector on their MEC8-DV Series product webpage.

Table 5.3: Edge-Card Connector Information

Ref Designator	Manufacturer	Connector P/N	Product Webpage
J11	Samtec	MEC8-170-02-L-DV	www.samtec.com/ProductInformation/TechnicalSpecifications/ProductSpecifications.aspx?series=MEC8-DV

5.4 USB Connector

The controller board contains one USB 2.0 mini-B device port that allows for connecting a development PC to the LightCommander. The datasheet for this USB mini-B connector can be found on FCI's website.

Table 5.4: USB Connector Information

Ref Designator	Manufacturer	Connector P/N	Manufacturer Website
J27	FCI	10033526-N3212LF	http://portal.fciconnect.com/portal/page/portal/FcicntPublic/HomePage

5.5 DC Power Input

The DC power input connector to the controller board is a Molex 4-pin disk drive power connector. The product specification and datasheet for this connector can be found on its product webpage.

Table 5.5: DC Power Connector Information

Ref Designator	Manufacturer	Connector P/N	Mating Connector P/N	Product Webpage
J5	Molex	15-24-4441	15-24-4048	www.molex.com/molex/products/datasheet.jsp?part=active/0015244441_PCB_HEADE_RS.xml&channel=Products&Lang=en-US

Table 5.6: DC Input Power Ratings

Parameter	Min	Typical	Max	Unit	Notes
VCC_5P0V Voltage	4.8	5	5.25	VDC	1
VCC_5P0V Current	—		7	A	

Notes:

1. All voltages given with respect to DGND

Table 5.7: DC Power Input Connector Pin Descriptions

Pin	Signal	I/O	Description
1	RFU	NC	Reserved for future use. Do not connect.
2	DGND	I	Ground. Connect to digital ground.
3	DGND	I	Ground. Connect to digital ground.
4	VCC_5P0V	I	5V power input.

5.6 Internal Expansion Connectors

The controller board features two internal connectors that can be used for custom expansion boards. Both connectors are Samtec micro socket strips; J500 is a 50-pin connector, whereas J505 is a 40-pin connector. The datasheets for these connectors can be found on the Samtec product webpage.

Table 5.8: Internal Expansion Connector Information

Ref Designator	Manufacturer	Connector P/N	Mating Connector P/N	Product Webpage
J500	Samtec	SFM-125-02-S-D-LC	TFM-125-02-S-D-LC	https://www.samtec.com/ProductInformation/TechnicalSpecifications/Overview.aspx?series=SFM
J505	Samtec	SFM-120-02-S-D-LC	TFM-125-02-S-D-LC	https://www.samtec.com/ProductInformation/TechnicalSpecifications/Overview.aspx?series=SFM

Table 5.9: Internal Expansion Connector Power Ratings

Parameter	Min	Typical	Max	Unit
VCC_5P0V Voltage				
VCC_5P0V Current	—	—	1	A
VCC_EXP Voltage	1.8	—	3.3	V
VCC_EXP Current	—			mA
VIH High-level input voltage	VCC_EXP – 0.4	—	3.3	V
VIL Low-level input voltage	0	—	0.15	V

Table 5.10: J500 Connector Pin Descriptions

J500 Pin	Signal	I/O	Description
1	EXP_CON_RGB_OE	I	DLPC200 PORT2_IVALID signal.
2	RFU	NC	Reserved for future use. Do not connect.
3	EXP_CON_RGB_FLD_R2	I	DLPC200 PORT2_D18 (Pixel Data – Red 2)
4	EXP_CON_RGB_B0	I	DLPC200 PORT2_D0 (Pixel Data – Blue 0)
5	EXP_CON_RGB_G0	I	DLPC200 PORT2_D8 (Pixel Data – Green 0)
6	EXP_CON_RGB_B1	I	DLPC200 PORT2_D1 (Pixel Data – Blue
7	EXP_CON_RGB_R0	I	DLPC200 PORT2_D16 (Pixel Data – Red 0)
8	EXP_CON_RGB_R1	I	DLPC200 PORT2_D17 (Pixel Data – Red 1)
9	EXP_CON_RGB_B3	I	DLPC200 PORT2_D3 (Pixel Data – Blue 3)
10	EXP_CON_RGB_B4	I	DLPC200 PORT2_D4 (Pixel Data – Blue 4)
11	EXP_CON_RGB_B5	I	DLPC200 PORT2_D5 (Pixel Data – Blue 5)
12	EXP_CON_RGB_B6	I	DLPC200 PORT2_D6 (Pixel Data – Blue 6)
13	EXP_CON_RGB_B7	I	DLPC200 PORT2_D7 (Pixel Data – Blue 7)
14	EXP_CON_RGB_G2	I	DLPC200 PORT2_D10 (Pixel Data – Green 2)
15	EXP_CON_RGB_G3	I	DLPC200 PORT2_D11 (Pixel Data – Green 3)
16	EXP_CON_RGB_G4	I	DLPC200 PORT2_D12 (Pixel Data – Green 4)
17	DGND	I	Ground. Connect to digital ground.
18	EXP_CON_IO_B25		DLPC200 RSVD_S5
19	EXP_CON_RGB_B2	I	DLPC200 PORT_D2 (Pixel Data – Blue 2)
20	EXP_CON_RGB_HSYNC	I	DLPC200 PORT_HSYNC (Horizontal Sync)
21	EXP_CON_IO_K28		DLPC200 RSVD_S11
22	EXP_CON_IO_C20		DLPC200 RSVD_S6
23	EXP_CON_RGB_CLK	I	DLPC200 PORT2_CLK (Pixel Clock)
24	EXP_CON_RGB_VSYNC	I	DLPC200 PORT2_VSYNC (Vertical Sync)
25	DGND	I	Ground. Connect to digital ground.

J500 Pin	Signal	I/O	Description
26	DGND	I	Ground. Connect to digital ground.
27	EXP_CON_RGB_G5	I	DLPC200 PORT2_D13 (Pixel Data – Green 5)
28	EXP_CON_RGB_G6	I	DLPC200 PORT2_D14 (Pixel Data – Green 6)
29	EXP_CON_RGB_G7	I	DLPC200 PORT2_D15 (Pixel Data – Green 7)
30	EXP_CON_RGB_R3	I	DLPC200 PORT2_D19 (Pixel Data – Red 3)
31	EXP_CON_RGB_R4	I	DLPC200 PORT2_D20 (Pixel Data – Red 4)
32	EXP_CON_RGB_R5	I	DLPC200 PORT2_D21 (Pixel Data – Red 5)
33	EXP_CON_RGB_R6	I	DLPC200 PORT2_D22 (Pixel Data – Red 6)
34	EXP_CON_RGB_R7	I	DLPC200 PORT2_D32 (Pixel Data – Red 7)
35	DGND	I	Ground. Connect to digital ground.
36	DGND	I	Ground. Connect to digital ground.
37	EXP_CON_I2C_SCL	I	DLPC200 I2C_SCL (Master I2C Clock)
38	RFU	NC	Reserved for future use. Do not connect.
39	EXP_CON_I2C_SDA	I/O	DLPC200 I2C_SDA (Master I2C Data)
40	EXP_CON_RGB_G1	I	DLPC200 PORT2_D9 (Pixel Data – Green 1)
41	RFU	NC	Reserved for future use. Do not connect.
42	RFU	NC	Reserved for future use. Do not connect.
43	DGND	I	Ground. Connect to digital ground.
44	DGND	I	Ground. Connect to digital ground.
45	RFU	NC	Reserved for future use. Do not connect.
46	RFU	NC	Reserved for future use. Do not connect.
47	DGND	I	Ground. Connect to digital ground.
48	DGND		Ground. Connect to digital ground.
49	RFU	NC	Reserved for future use. Do not connect.
50	RFU	NC	Reserved for future use. Do not connect.

Table 5.11: J505 Connector Pin Descriptions

J505 Pin	Signal	I/O	Description
1	DGND	I	Ground. Connect to digital ground.
2	VCC_EXP	I	Sourced from external connection to power level shifters, this should be the same voltage as the signals being sent to the controller board. Users must supply a voltage to this pin to set the I/O voltage levels. This signal powers level shifters on the controller board.
3	EXP_CON_LAMPEN	O	DLPC200 SYNC_0 (Configurable Strobe)
4	EXP_CON_LED_nLIT	I	Not connected by default. If R18 is populated and U3 is removed, this signal drives DLPC200 pin J28 (LED_LIT) input.
5	DGND	I	Ground. Connect to digital ground.
6	EXP_CON_SYNC_IN0	I	DLPC200 PORT1_Trig_in (Alternate sync for port 1)
7	EXP_CON_IO_D19		DLPC200 RSVD_S8
8	EXP_CON_SYNC_OUT0	O	DLPC200 PORT1_Sync_out (Programmable Sync output)
9	EXP_CON_STROBE3	O	DLPC200 LED_BLU_EN (Blue LED Enable Strobe)
10	EXP_CON_SYNC_IN1	I	DLPC200 PORT2_Trig_in (Alternate sync for port 2)
11	EXP_CON_LED_VSYNC	O	DLPC200 LED_SYNC (RFU)

J505 Pin	Signal	I/O	Description
12	EXP_CON_LAMPSYNCEN	O	DLPC200 LED_SYNCEN (Inverted LED_LIT signal)
13	DGND	I	Ground. Connect to digital ground.
14	DGND	I	Ground. Connect to digital ground.
15	EXP_CON_SSI_DIN	O	Not connected by default. Populating R14 and removing R13 allows this signal to connect directly to J4.
16	EXP_CON_SSI_DOUT	I	Not connected by default. Populating R10 and removing R9 allows this signal to connect directly to J4.
17	EXP_CON_SSI_CLK	I	Not connected by default. Populating R6 and removing R2 allows this signal to connect directly to J4.
18	EXP_CON_SSI_nOE	I	Not connected by default. Populating R8 and removing R7 allows this signal to connect directly to J4.
19	EXP_CON_SSI_nDIR	I	Not connected by default. Populating R12 and removing RR11 allows this signal to connect directly to J4.
20	DGND	I	Ground. Connect to digital ground.
21	VCC_5P0V	I	5V power rail that is available to be used on the expansion interface for power a mezzanine board
22	EXP_CON_LED_nEN	I	Not connected by default. Populating R27 and removing R28 allows this signal to J4.
23	EXP_CON_STROBE4	O	DLPC200 LED_SUBFRAME (Subframe signal to LED Driver)
24	EXP_CON_IO_N25		DLPC200 RSVD_S14
25	EXP_CON_STROBE5	O	DLPC200 SYNC_0 (Programmable Strobe)
26	EXP_CON_SYNC_OUT1	O	DLPC200 PORT2_Sync_out (Programmable Pattern Sync Output)
27	EXP_CON_IO_F22		RSVD_S10
28	EXP_CON_STROBE0	O	DLPC200 LED_IR_EN (IR LED Enable Strobe)
29	EXP_CON_STROBE1	O	DLPC200 LED_RED_EN (RED LED Enable Strobe)
30	EXP_CON_STROBE2	O	DLPC200 LED_GRN_EN (Green LED Enable Strobe)
31	DGND	I	Ground. Connect to digital ground.
32	EXP_CON_SPI_MISO	O	DLPC200 SLAVE_SPI_MISO (SLAVE SPI Data IN)
33	EXP_CON_SPI_MOSI	I	DLPC200 SLAVE_SPI_MOSI (SLAVE SPI Data OUT)
34	EXP_CON_SPI_CLK	I	DLPC200 SLAVE_SPI_CLK (SLAVE SPI CLOCK)
35	EXP_CON_SPI_nSS	I	DLPC200 SLAVE_SPI_CS (SLAVE SPI Chip Select)
36	EXP_CON_SPI_nACK	O	DLPC200 SLAVE_SPI_ACK (RFU)
37	EXP_CON_SPI_nSOP	O	DLPC200 SLAVE_SPI_nSOP (RFU)
38	DGND	I	Ground. Connect to digital ground.
39	EXP_CON_STROBE6	O	DLPC200 SYNC_1 (Programmable Strobe)
40	EXP_CON_STROBE7	O	DLPC200 SYNC_2 (Programmable Strobe)

5.7 LED Drive Connector

The LED drive connector on the controller board is a disconnectable crimp style connector from JST. This connector contains all the signals required to control the Light Source that is included with the kit. The datasheet for this connector can be found on the JST website by locating the “GH connector” product under the “Wire to Board Crimp Style Connectors” category.

Table 5.12: LED Drive Connector Information

Ref Designator	Manufacturer	Connector P/N	Mating Connector P/N	Manufacturer Website
J4	JST	SM15B-GHS-TB (LF)(SN)	GHR-15V-S	www.jst.com/home2.html

Table 5.13: LED Signals on the J4 Connector

J4 Pin	Signal	I/O	Description
1	LED_SPI_MISO	I	DLPC200 LED_SPI_MISO (LED SPI MASTER Data IN)
2	LED_SPI_DIR	O	DLPC200 LED_SPI_DIR (LED SPI MASTER Driver Reset)
3	LED_SPI_MOSI	O	DLPC200 LED_SPI_MOSI (LED SPI MASTER Data OUT)
4	LED_SPI_nCS	O	DLPC200 LED_SPI_nCS (LED SPI MASTER Chip Select)
5	DGND	I	Ground. Connect to digital ground.
6	LED_SPI_CLK	O	DLPC200 LED_SPI_CLK (LED SPI MASTER CLOCK)
7	DGND	I	Ground. Connect to digital ground.
8	LED_SENS	O	DLPC200 LED_SENS (RFU)
9	STROBE3	O	DLPC200 LED_BLU_EN (Blue LED Enable Strobe)
10	STROBE2	O	DLPC200 LED_GRN_EN (Green LED Enable Strobe)
11	STROBE1	O	DLPC200 LED_RED_EN (Red LED Enable Strobe)
12	STROBE0	O	DLPC200 LED_IR_EN (IR LED Enable Strobe)
13	STROBE4	O	DLPC200 LED_SUBFRAME (Programmable Subframe for LED Driver)
14	LED_nLAPLIT	I	DLPC200 LED_LIT (LED Driver Status)
15	LED_EN	O	DLPC200 LED_EN (LED Driver Enable, active low)

Table 5.14: LED Drive Connector Power Ratings

Parameter	Min	Typical	Max	Unit	Notes
SPI Signals V _{OH}				V	1
SPI Signals V _{OL}				V	1
SPI Signals I _{OH}				mA	1
SPI Signals I _{OL}				mA	1
Strobe V _{OH}	2.2	—	VCC_3P3V	V	
Strobe V _{OL}	0	—	0.55	V	
Strobe I _{OH}	—	—	-24	mA	
Strobe I _{OL}	—	—	24	mA	
LED_nLAPLIT V _{IH}	1.48	—	1.92	V	
LED_nLAPLIT V _{IL}	0.89	—	1.2	V	

Notes:

1. Please refer to the I/O Characteristics section of the DLPC200 Datasheet.

5.8 Fan/Aux Power Connectors

Two connectors on the controller board are available to use onboard power for a fan or other auxiliary device. The product specification and datasheet for this connector can be found on its product webpage.

Table 5.15: Fan/Aux Power Connector Information

Ref Designator	Manufacturer	Connector P/N	Mating Connector P/N	Product Webpage
J1	Molex	22-05-3031	22-01-3037	www.molex.com/molex/products/datasheet.jsp?part=active/0022053031_PCB_HEADER_S.xml&channel=Products&Lang=en-US
J2	Molex	22-05-3031	22-01-3037	www.molex.com/molex/products/datasheet.jsp?part=active/0022053031_PCB_HEADER_S.xml&channel=Products&Lang=en-US

Table 5.16: Fan/Aux Connector Power Ratings

Parameter	Min	Typical	Max	Unit
Output Voltage	4.8	5	5.25	V
Output Current	—	—	1	A

Table 5.17: Fan/Aux Connector Pin Descriptions

Pin	Signal	I/O	Description
1	VCC_5P0V	I	5V Auxiliary Power.
2	DGND	I	Ground. Connect to digital ground.
3	RFU	NC	Reserved for future use. Do not connect.

6 Mechanical Specifications

6.1 Mechanical Characteristics of Controller Board

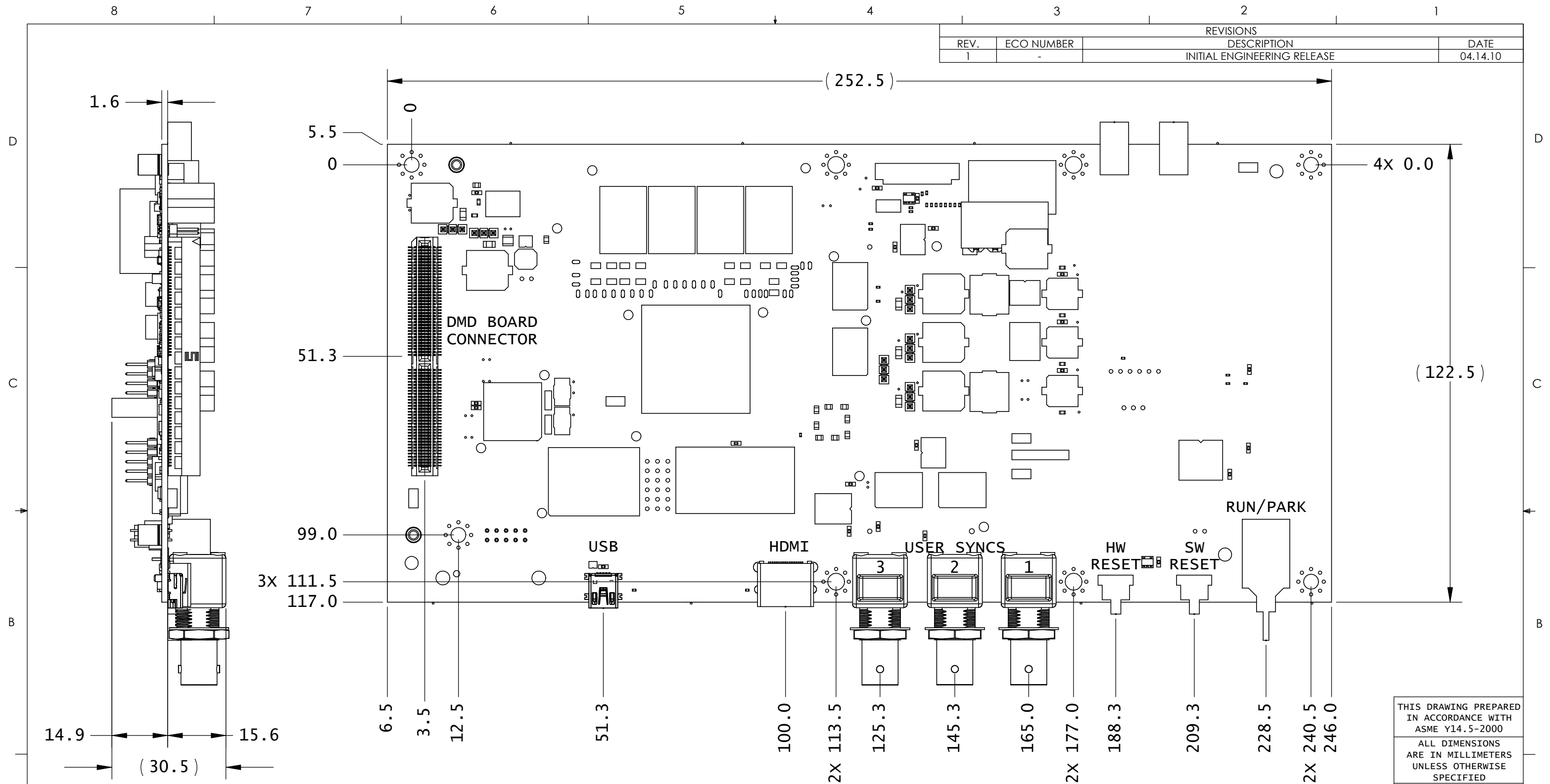
Table 6.1: Controller Board Size and Weight

Parameter	Min	Typical	Max	Unit
Dimensions	—	252.5(w) x 122.5(l)	—	mm
Weight	—	225	—	g

7 Controller Board Mechanical Drawings

The following two pages provide mechanical drawings of the controller board.

REVISIONS			
REV.	ECO NUMBER	DESCRIPTION	DATE
1	-	INITIAL ENGINEERING RELEASE	04.14.10



BOTTOM

NOTES:

- 1 CONNECTOR SPECIFICATION: SAMTEC SFM-125-02-S-D-LC
- 2 CONNECTOR SPECIFICATION: SAMTEC SFM-120-02-S-D-LC
- 3 PIN 1 LOCATION
- 4 STANDOFF SPECIFICATION: PEM SMTSO-440-8ET
- 5. DO NOT SCALE DRAWING

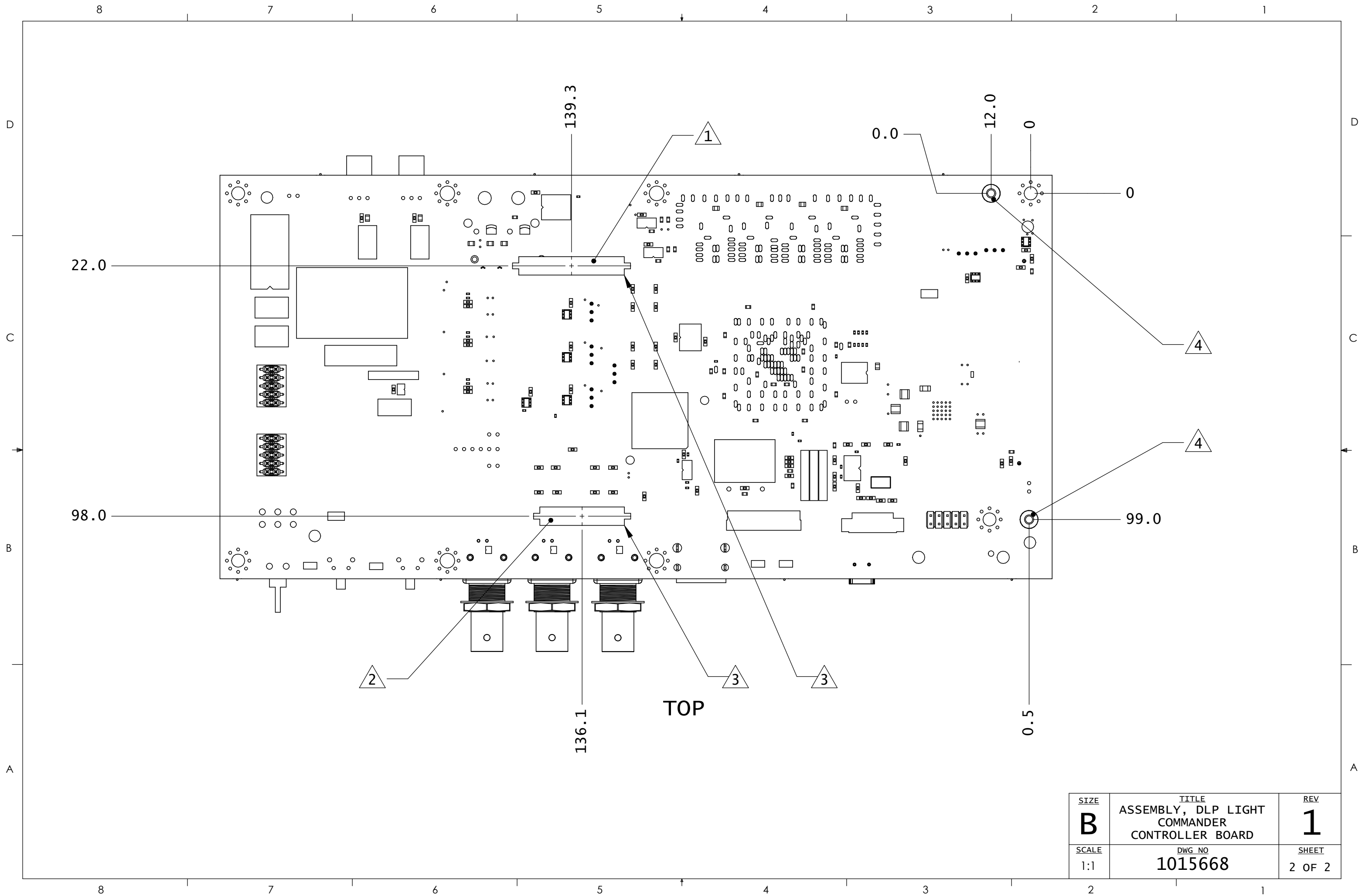
THIS DRAWING PREPARED IN ACCORDANCE WITH ASME Y14.5-2000
 ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED
 TOLERANCES UNLESS OTHERWISE SPECIFIED
 X ± 0.5
 X.X ± 0.2
 X.XX ± 0.1
 X" ± 1"

THIRD ANGLE PROJECTION

ENG	DATE
KAG	04.14.10
CHECK	DATE
PMH	04.14.10
MGR	DATE
MANF	DATE

LOGIC
 411 N. Washington Ave. Suite 400 Minneapolis, MN 55401
 T: 612.672.9495 F: 612.672.9489 I: www.logicpd.com

SIZE	TITLE	REV
B	ASSEMBLY, DLP LIGHT COMMANDER BOARD	1
SCALE	DWG NO	SHEET
1:1	1015668	1 OF 2



SIZE	TITLE	REV
B	ASSEMBLY, DLP LIGHT COMMANDER CONTROLLER BOARD	1
SCALE	DWG NO	SHEET
1:1	1015668	2 OF 2