User's Guide

DLP® LightCrafter™ Display 471TP EVM User's Guide

ABSTRACT

This user's guide presents an overview of the DLP® LightCrafter™ Display 471TP evaluation module (EVM) and a general description of the main features and functions. The document explains the first steps to getting started and shows a detailed description of onboard LEDs, connectors, and overall EVM assembly. The document provides the user a start with their first DLP LightCrafter Display 471TP evaluation module.

In addition to this document, additional reference documents are provided in Section 2.

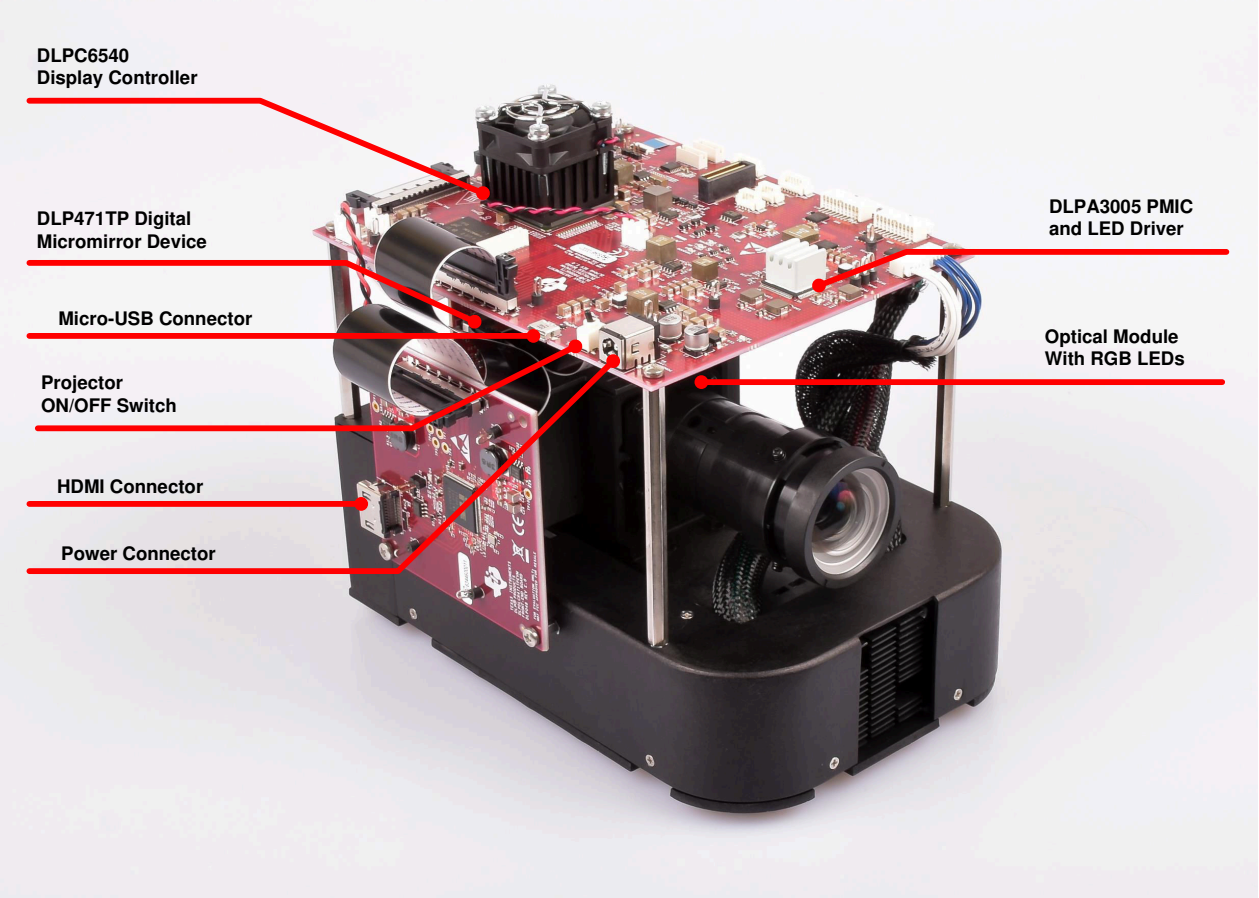

Figure 1-1. DLP LightCrafter Display Complete EVM

This design incorporates HDMI® technology.

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1 Safety Instructions

CAUTION

Hot surface. To minimize risk of burns, do not touch.

WARNING

Possible hazardous optical radiation emitted from this product. Do not stare at the operating LEDs. May be harmful to the eye.

WARNING

Observe handling precautions. Electrostatic sensitive devices.

WARNING

Always ensure all fans are running during operation to help avoid overheating and ensure reliable operation.

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2 Applicable Documents

The following documents are applicable to the DLP LightCrafter Display 471TP EVM and are available at TI.com.

1. Texas Instruments, *DLP471TP .47 4K UHD DMD* data sheet.
2. Texas Instruments, *DLPA3005 PMIC and High-Current LED Driver IC* data sheet.
3. Texas Instruments, *DLPC6540 High Resolution Display Controller* data sheet.
4. Texas Instruments, *DLPC6540 Software Programmer's Guide*.
5. Texas Instruments, *DLP®LightCrafter™ Display and Light Control EVM GUI Tool* user's guide.

If you need additional assistance, refer to the DLP Products and MEMS TI E2E™ community support forums.

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3 DLP LightCrafter Display 471TP EVM Components

The DLP LightCrafter Display module consists of three subsystems:

- Light engine – Includes the optics, red, green, and blue LEDs, DMD interface board, and a DLP471TP 4K UHD DMD capable of over 500 lumens out-of-the-box.
- Formatter Board – Includes the DLP chipset comprised of a DLPC6540 controller and DLPA3005 PMIC/LED driver, USB, and power connector.
- Front-End Board – Includes the HDMI receiver and external HDMI connector.

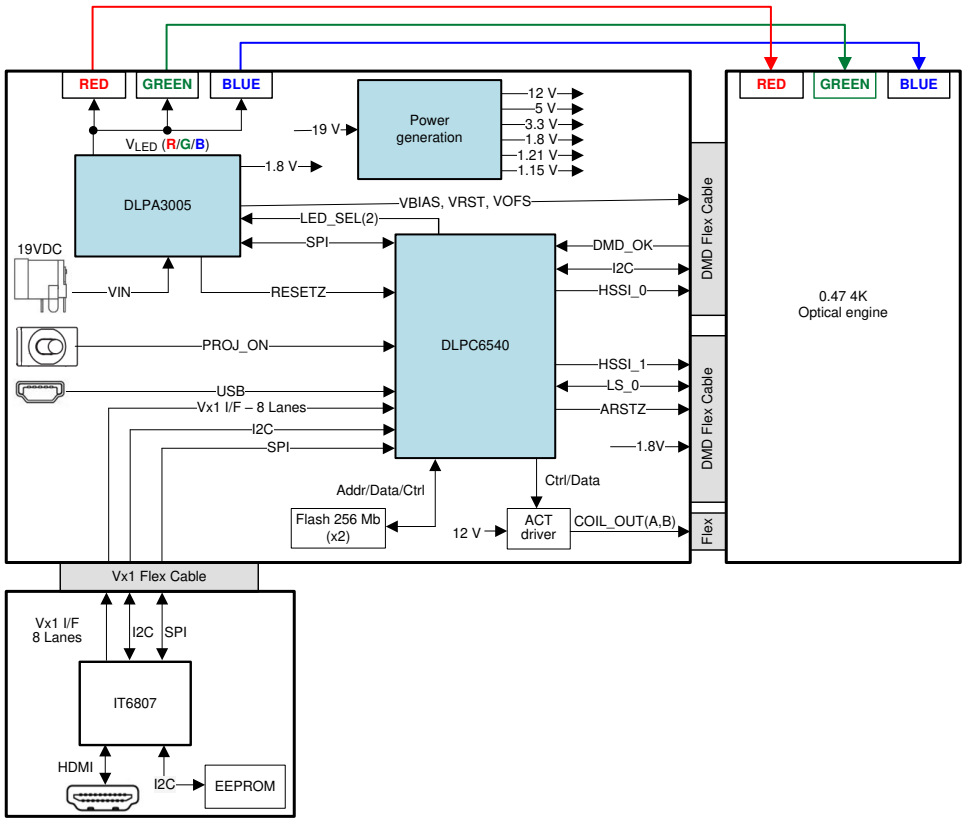

Figure 3-1. DLP LightCrafter Display EVM Block Diagram

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4 Light Engine

Anhua developed the optical engine in the EVM and is production ready. The light engine consists of the following components:

- DLP471TP (0.47-inch 4K UHD DMD).
- Osram red (LE A P1MQ), green (LE CG P1AQ), and blue (LE B P1MQ) LEDs.
- This light engine interfaces with the EVM using DMD pin mapping **Option 1**. For additional DMD interface information, refer to the *DLPC6540 High Resolution Controller* data sheet.

Table 4-1. Optical Engine Specifications

Parameter	MIN	TYP	MAX	UNIT
Brightness at 4-A RGB LED Current		500		lm
RGB LED Current		4		A
Brightness Uniformity	85%			
Throw Ratio		1.2		
Offset		100%		
Focusable Diagonal Image Size	60		120	inch

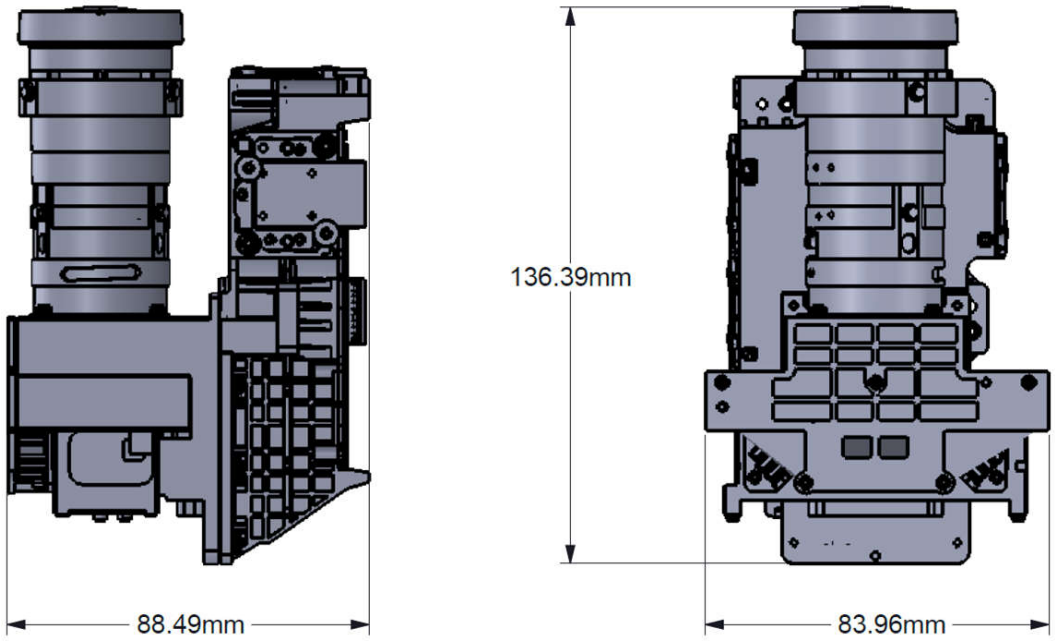

Figure 4-1. Optical Engine Dimensions

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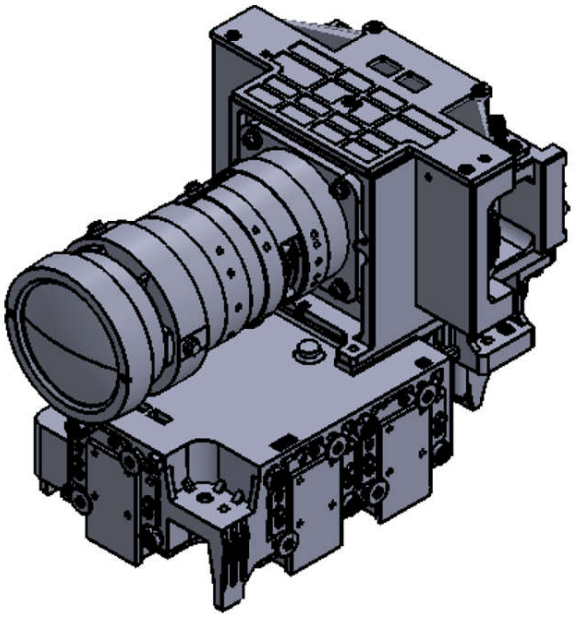

Figure 4-2. Optical Engine View

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5 Quick-Start Procedure

This quick-start procedure considers default conditions as shipped.

1. Power up the DLP LightCrafter Display 471TP EVM by applying an external DC power supply (19-V DC, 4.74A) to the J1 connector.

   External Power Supply Requirements:

   - Nominal Output Voltage: 19 VDC
   - Minimum Output Current: 2.5 A
   - Maximum Output Current: 4.74 A
   - Efficiency Level: VI
   - Connector Barrell Size: 2.5 x 5.5 x 8.25 [ID x OD x L(min)] mm
   - Connector Polarity: Center +

Note

- TI recommends using an external power supply that complies with applicable regional safety standards such as UL, CSA, VDE, CCC, and PSE.
- The P19VIN (D3), PWRGOOD (D5) and POSENSE (D8) LEDs on the Formatter board will turn on to indicate that input and standby powers are applied.

1. Move SW1 switch to the ON position to turn on the DLP LightCrafter Display 471TP EVM. When the DLP LightCrafter Display 471TP EVM is turned on, the POSENSE (D8) LED will turn off and PROJ_ON LED (D7) will turn on. The HEARTBEAT LED (D8) will start blinking.
2. After the DLP LightCrafter Display 471TP EVM is turned on, the projector will default to displaying a DLP LightCrafter Display splash image.
3. The focus of the image can be adjusted manually on the optical engine.

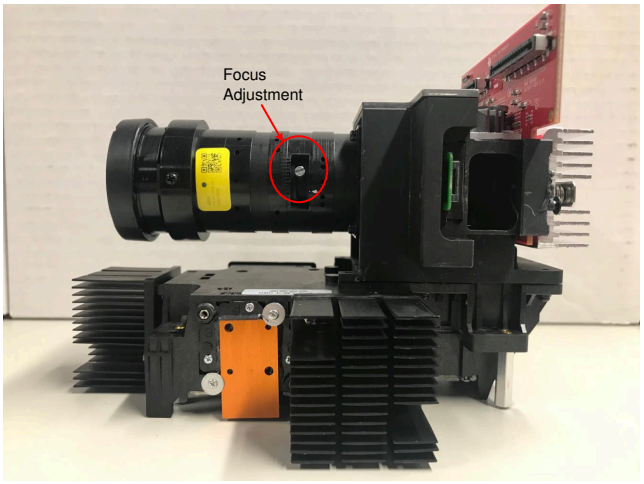

Figure 5-1. Optical Engine with Focus Adjustment

4. Connect the USB to the DLP LightCrafter Display 471TP EVM and open the latest GUI on your computer. If needed, connect an HDMI source to the EVM and communicate to the EVM via the GUI software.
5. When turning off the projector, turn off the SW1 switch prior to removing the power cable.

Note

To avoid potential damage to the DMD, it is recommended to turn off the projector with the SW1 switch before disconnecting the power.

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There are eight indicator LEDs on the DLP LightCrafter Display 471TP EVM (Formatter and Front-End boards), and they are defined in Table 5-1.

Table 5-1. Status LEDs on the DLP LightCrafter Display 471TP EVM

Board	LED Reference	Signal Indication	Description
Formatter	D1	LOCKN	Vx1 Interface locked.
Formatter	D3	VIN	Input 19 V power.
Formatter	D4	HEARTBEAT	BLINKING after SW1 Switched ON and ASIC is running.
Formatter	D5	PWRGOOD	ON when 19 V is applied and PMIC is up.
Formatter	D6	FAULT	Indicates ASIC SW fault has occurred.
Formatter	D7	PROJ_ON	ON when SW1 switched ON.
Formatter	D8	POSENSE	ON (Red) when 19 V power applied but PROJ_ON is still OFF.
Front-End	D4	SCDT_DR5	HDMI Input stable.

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6 Circuit Description

6.1 Connectors and Switches on Formatter Board

J1 Connector for 19-V external power supply interface.
J2 Connector for USB cable.
J3 Connector for Vx1 flex cable from Front-End Board.
J4 12-V power connector (used for EVM cooling fan).
J5 12-V power connector (spare).
J6 Connector for ASIC testpoints.
J7 DMD Interface flex cable connector (HSSI0 Bus).
J8 12-V power connector (used for ASIC cooling fan).
J9 Header for BOOT_HOLD jumper
J10 DMD Interface flex cable connector (HSSI1 Bus).
J11 Connector for Blue LED cable.
J12 Connector for IIC1 interface cable (spare).
J13 Connector for Actuator Current Driver interface (not installed by default).
J14 Header for Actuator Coil_A testpoint.
J15 Header for Actuator Coil_B testpoint.
J16 Connector for IIC0 interface cable (spare).
J17 Connector for actuator flex cable.
J18 Connector for Green LED cable.
J19 Connector for Red LED cable.
J20 Connector for ASIC JTAG cable.
J21 Connector for WPC interface cable (spare).
J22 Connector for SPI1 interface cable (spare).
J23 Connector for UART0 interface cable (spare)
SW1 Projector ON/OFF Switch.

6.2 Connectors on Front-End Board

J1 HDMI input connector.
J2 Header for EDID EEPROM programming jumper.
J3 Connector for Vx1 flex cable to Formatter Board.

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7 EVM Setup

The DLP LightCrafter Display 471TP EVM is composed of three parts:

- Front-End board
- Formatter Board
- Optical Engine with LED connections and Flex cables

The Front-End board contains the connector for the HDMI input and a flex cable connector for interfacing to Formatter board. Figure 7-1 shows the main connectors on the Front-End board.

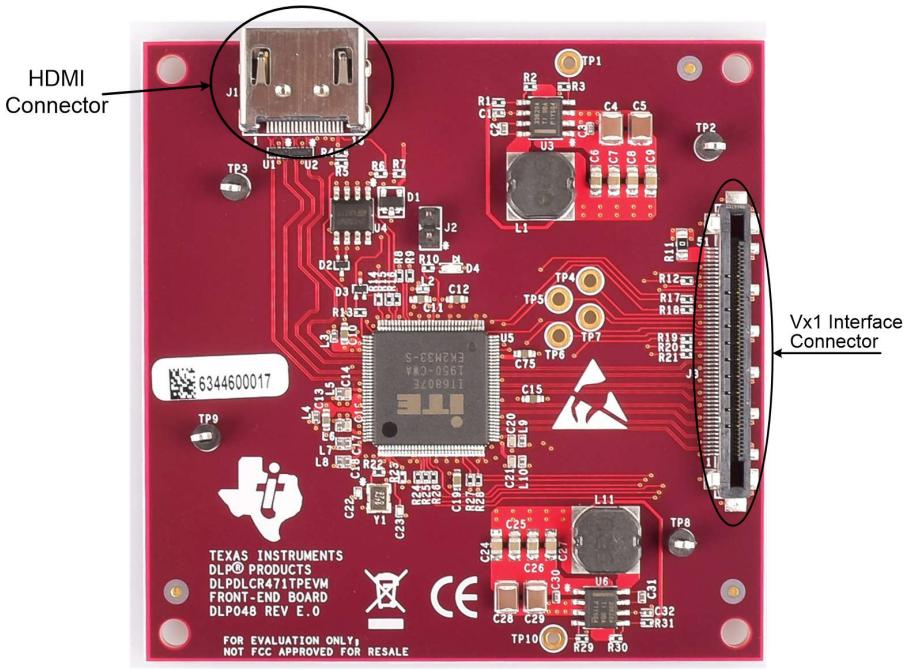

Figure 7-1. DLP LightCrafter Display Front-End Board

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The Formatter board contains connector for the external power supply, a USB connector to communicate to the DLP LightCrafter Display software, the RGB LED connectors, the DMD flex cable connectors, the Front-End Board interface flex connector, and 12 V fan power connectors. The Formatter board also contains a switch to turn on the projector after external power is supplied. The connectors for each LED are labeled on the board as well as on the light engine.

Always ensure a good connection of the flex cables, power cables and LED cables to the Formatter Board before turning the EVM on.

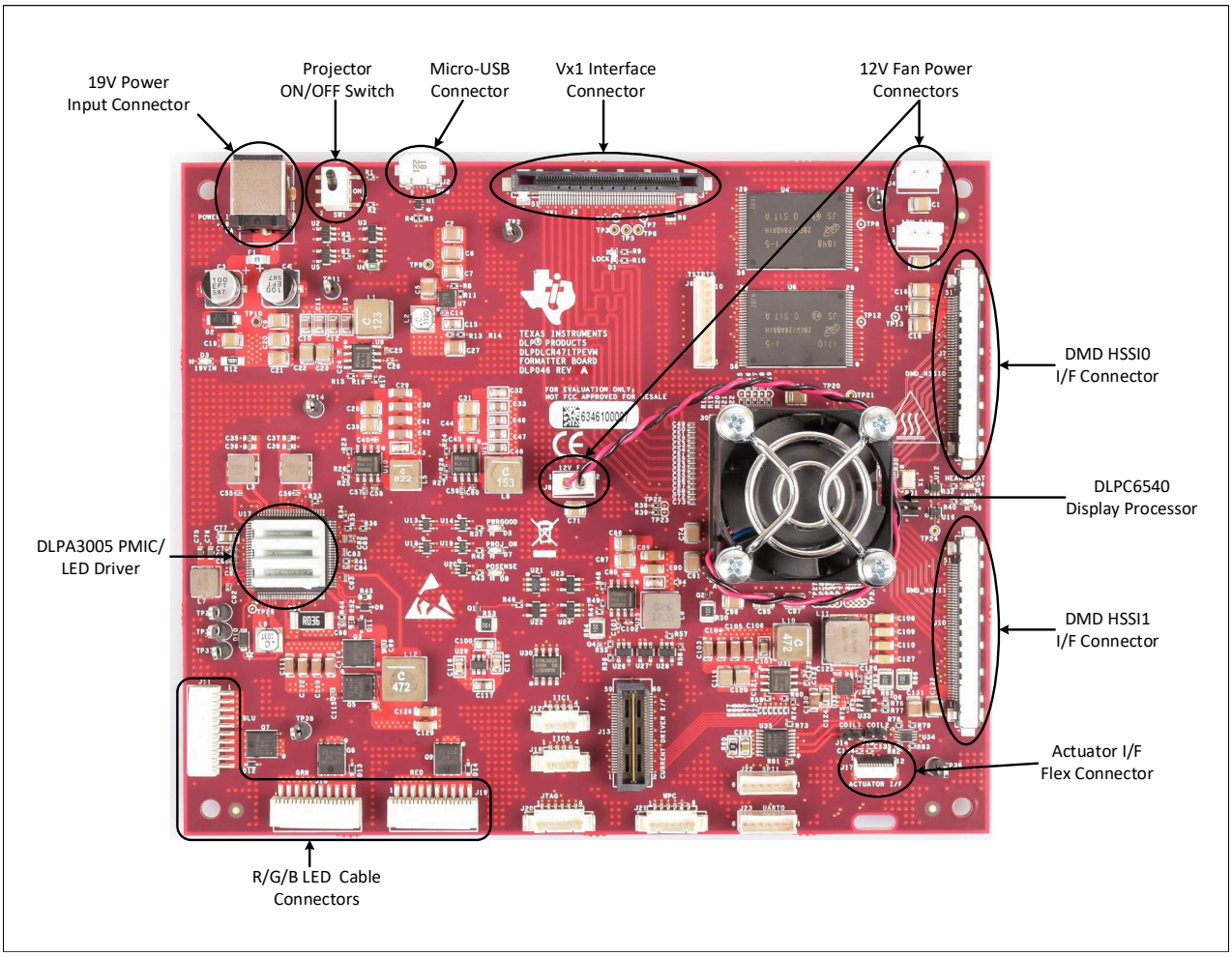

Figure 7-2. DLP LightCrafter Display Formatter Board

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8 Notifications

In Compliance with Article 33 provision of the EU REACH regulation, we are notifying you that this EVM includes component(s) containing at least one Substance of Very High Concern (SVHC) above 0.1%. These uses from Texas Instruments do not exceed 1 ton per year. The SVHC's are:

Table 8-1. REACH Compliance SVHC Substances

Component Manufacturer	Component Type	Component Part Number	SVHC Substance	SVHC CAS
ITE Tech Inc.	HDMI Receiver	IT6807E/DW	4,4'-isopropylidene diphenol; Bisphenol A: BPA	80-05-7
Bourns	TVS Diode	SMAJ22A	Lead	7439-92-1
Anhua	Optical Engine	T-F16D	Diboron Trioxide	1303-86-2

9 Revision History

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

Changes from March 31, 2021 to October 31, 2025 (from Revision * (March 2021) to Revision A (October 2025)) **Page**

- Added HDMI trademark information..... 3

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