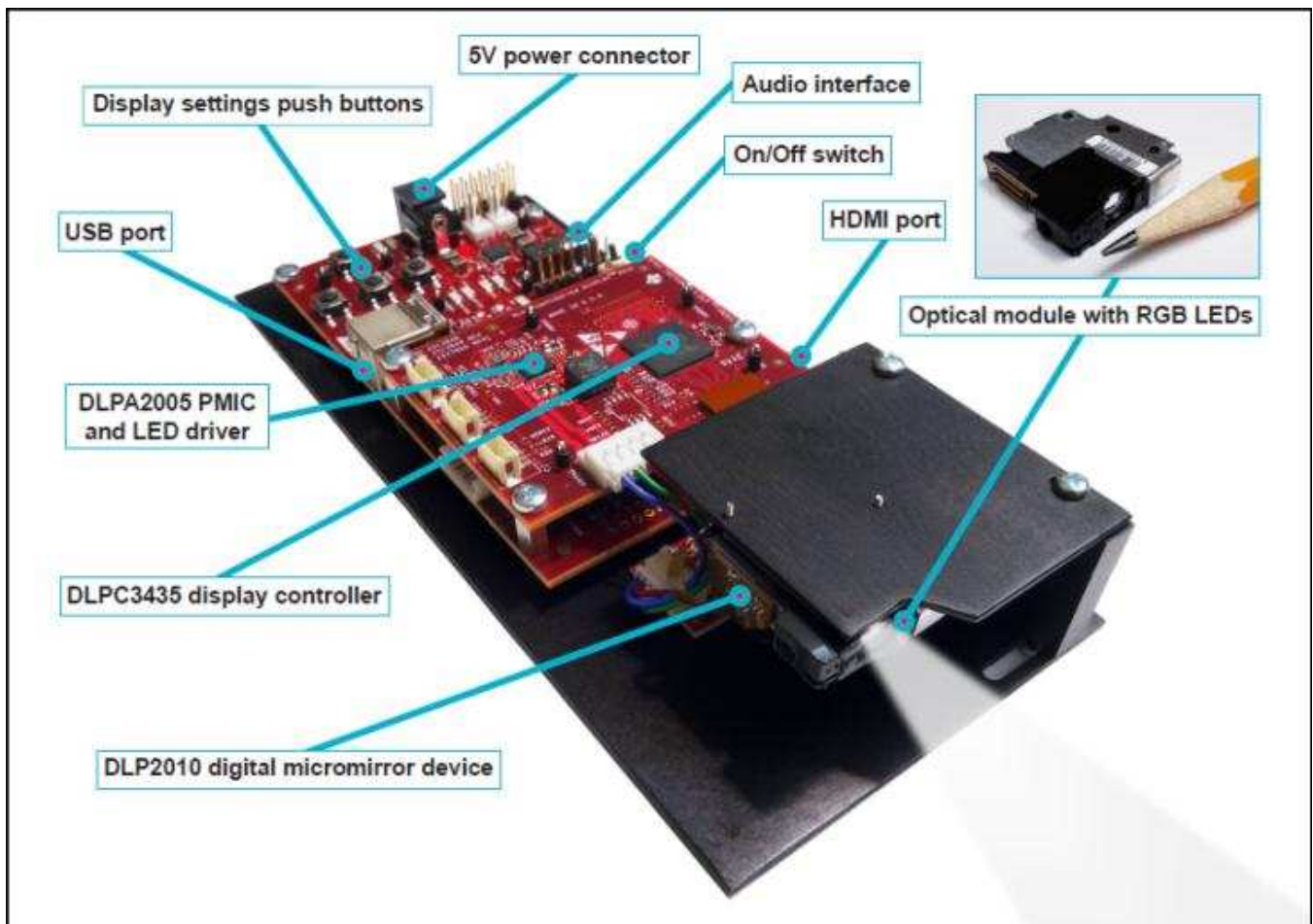


## **DLP® LightCrafter™ display 2010 EVM user's guide**

This user's guide presents an overview of the DLP LightCrafter Display 2010 evaluation module (EVM) and a general description of the main features and functions. It explains how to get started, and provides a detailed description of the push buttons function, the on-board LEDs, and the main connectors.



**Figure 1. DLP LightCrafter Display complete EVM**

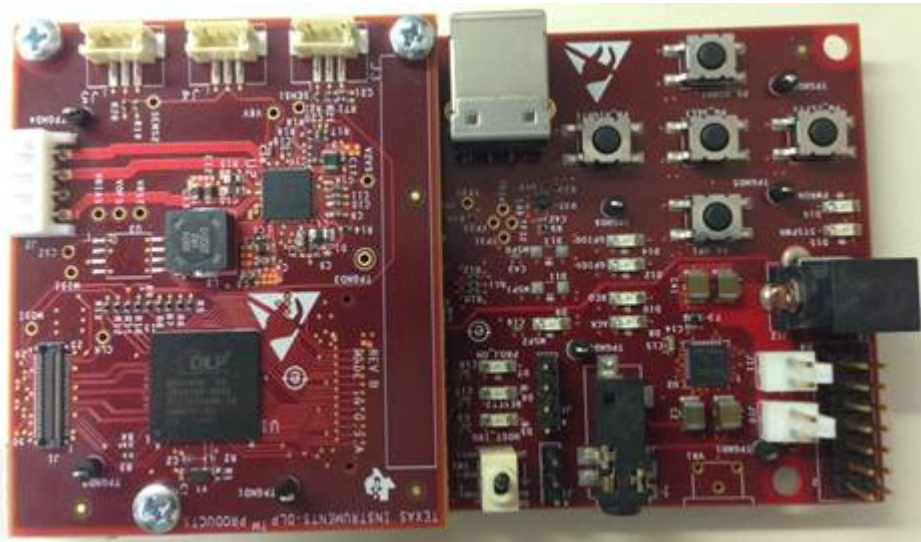
Topic	Page
1 DLP® LightCrafter™ Display 2010 PCB Overview .....	3
2 Applicable Documents.....	3
3 What is in the LightCrafter Display 2010 EVM? .....	4
4 Light Engine.....	5
5 Quick-Start Procedure .....	5
6 Circuit Description .....	6
7 EVM Setup .....	7

## Trademarks

LightCrafter is a trademark of Texas Instruments.  
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## 1 DLP® LightCrafter™ Display 2010 PCB Overview

DLPDLCR2010EVM-PCB is the PCB-only version of the DLP LightCrafter Display 2010 evaluation module (EVM). This EVM only includes the drive electronics for the DLP2010 DMD without any optical module. This EVM can be used for integrating your choice of DLP2010 DMD based optical module using proper flex cable for DMD interface and LED interface (please refer to the schematics for pinout and layout information). Typically the flash memory (which stores the firmware) is part of the optical engine, and therefore DLPDLCR2010EVM-PCB does not have the flash memory installed. If you would like to install the flash memory, please refer the DLPC3435 datasheet ([DLPS038](#)) for flash memory requirements and recommend flash memory.



**Figure 2. DLP LightCrafter Display PCB**

In addition to this document, see [Section 2](#) for more information.

## 2 Applicable Documents

The following documents are applicable to the DLP LightCrafter Display 2010 EVM and are available at [www.ti.com](http://www.ti.com).

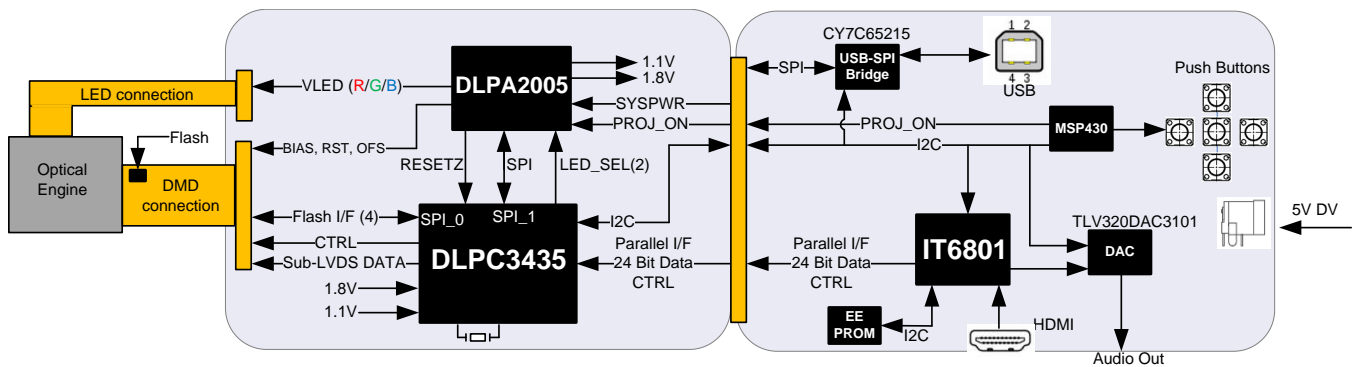
- DLP2010 (0.2 WVGA) DMD data sheet ([DLPS046](#))
- DLPC3435 controller data sheet ([DLPS038](#))
- Software Programmer's Guide ([DLPU020A](#))
- DLP LightCrafter Display EVM GUI Tool User's Guide ([DLPU021](#))

For assistance, refer to the [DLP and MEMS TI E2E community support forums](#).

### 3 What is in the LightCrafter Display 2010 EVM?

The DLP LightCrafter Display module consists of three subsystems:

- **Light engine:** includes the optics, red, green, and blue LEDs, and the 854 x 480 (WVGA) DMD. Capable of 25 lumens out-of-the-box.
- **Driver board:** includes the DLP chipset comprising of DLPC3435 Controller and DLPA2005 PMIC/LED driver.
- **System board:** includes MSP430, ITE HDMI receiver, USB-I2C bridge and several connectors for external inputs (for example, HDMI or USB).



**Figure 3. DLP LightCrafter Display EVM Block Diagram**

#### 4 Light Engine

The optical engine in the EVM is developed by Asia Optics and is production ready.

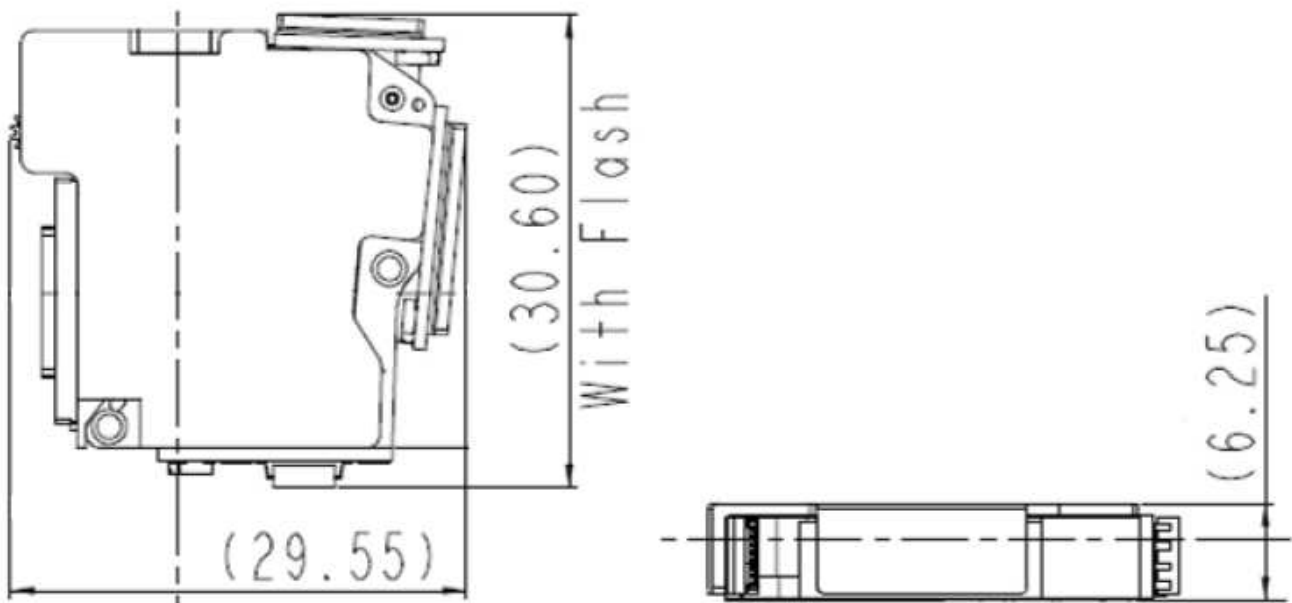
The light engine consists of the following components:

- 0.2-inch WVGA DMD (DLP2010)
- OSRAM red, green and blue LED – LE BA Q6WM and LCG H9RM
- This light engine interfaces with the EVM using DMD pin mapping **Option 1**. Please refer to the [DLPC3430](#) and [DLPC3435](#) datasheet for more information about the DMD interface.

**Table 1. Optical Engine Specifications**

PARAMETER	MIN	TYP	MAX	UNIT
Brightness		25		Lum
LED current		650		mA
Brightness uniformity	75%			
Throw ratio		1.65		
Offset		100%		
Focus range	5		50	inch
Image diagonal size	5		50	inch

The dimensions of the optical engine are shown in [Figure 4](#):



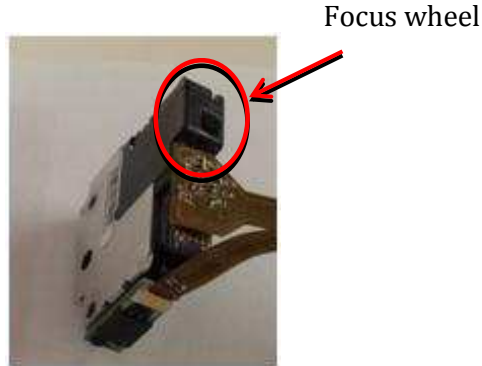
**Figure 4. Dimensions of Optical Engine**

#### 5 Quick-Start Procedure

This quick-start assumes default conditions as shipped.

1. Power up the DLP LightCrafter™ Display 2010 EVM by applying an external DC power supply (5-V DC, 3.0 A) to the J12 connector.
  - Note: Use an AC-DC switching power supply which accepts 50-60Hz 100-240VAC inputs, and outputs a nominal 5 VDC at maximum 3-A output current. The PWRON (D16) and SYSPWR (D15) LED turns on to indicate that 5-V power is applied.

2. Move the SW\_ONOFF switch to the ON position to turn the DLP LightCrafter™ Display 2010 EVM on. When the LightCrafter™ Display 2010 EVM is turned on, the PROJ\_ON LED turns on.
3. After the DLP LightCrafter™ Display 2010 EVM is turned on, the projector default is to display a DLP LightCrafter™ Display splash image.
4. The focus of the image can be adjusted with the focus wheel on the optical engine.



**Figure 5. Optical Engine with Focus Wheel**

5. Connect USB to the LightCrafter Display 2010 EVM and open the GUI on your Computer. If needed, connect an HDMI source to the EVM and communicate to the EVM over the GUI software.
6. When turning off the projector, turn off the SW\_ONOFF switch prior to removing power cable. Note: To avoid potential damage to the DMD, it is recommended to turn off the projector with the SW\_ONOFF before disconnecting the power.
7. There are ten indicator LEDs on the DLP LightCrafter™ Display 2010 EVM ( [Table 2](#)):

**Table 2. LEDs on the DLP LightCrafter Display 2010 EVM**

D15	SYSPWR	5-V Power applied
D16	PWRON	Regulated 3V3 power on
D7	PROJ_ON	On when Projector is turned on via SW_ONOFF
D6	RESETZ	OFF when Projector is turned on via SW_ONOFF
D5	HOST_IRQ	ON during DLPC3435 boot OFF when projector is running. Indication of DLPC3435 boot-up completed and ready to receive commands
D9	MSP2	ON when HDMI cable plugged in and external video detected. OFF when external video is not detected.
D8	ACK	ON when Cypress CY3420 is I2C master OFF when MSP430 is I2C master
D10	REQ	ON when Cypress CY3420 requests the MSP430 to give Cypress master control of the I2C bus
D12	GPIO1	Blinking when PC is communicating to flash over SPI
D14	GPIO0	Blinking when PC is communicating to DLPC3435 over I2C

## 6 Circuit Description

### 6.1 Connectors, Switch and Push buttons on Main Board

**Table 3. List of Installed Connectors on the Main board**

INSTALLED CONNECTORS/HEADERS	DESCRIPTION
J12	Connector for 5-V external power supply interface
J7	Connector for USB cable
J2	Connector for Audio
J4	Connector for HDMI input

**Table 3. List of Installed Connectors on the Main board (continued)**

INSTALLED CONNECTORS/HEADERS	DESCRIPTION
J1	MSP430 JTAG Programming interface connector
J13	Connector for the I <sup>2</sup> C interface (DevaSys box)
J6	60 pin connector for DLP LightCrafter Display board
J10	Header for 5-V DC power
J11	Header for 5-V DC power
J3	Unsupported
J5	Unsupported

**Table 4. List of Installed Push Buttons and Switch on Main Board**

INSTALLED SWITCHES/PUSH BUTTONS	DESCRIPTION
SW1	Projector On/OFF Switch
PB-UP1	Source selection 1. Press: TPG 2. Press: HDMI input 3. Press: Splash screen
PB-SEL1	Cycle through displaying 7 curtain colors
PB-DOWN1	Flip image N/S or E/W
PB_LEFT1	Cycle 9 different TPG patterns after TPG source selected Cycle 4 different Splash screens after Splash source selected Change of Volume when HDMI input is selected
PB_RIGHT1	Change LED current total 7 steps Change of Volume when HDMI input is selected

## 6.2 Connectors on DLP LightCrafter™ Display board

**Table 5. List of Installed Connectors on the DLP LightCrafter™ Display Board**

INSTALLED SWITCHES/PUSH BUTTONS	DESCRIPTION
J1	Connector for the DMD flex cable
J2	Connector for LED cable
J3	Connector for external temperature sensor (Requires removing R21)
J4	Connector for light sensor
J5	Future use
J6	60 pin connector for DLP LightCrafter Display board

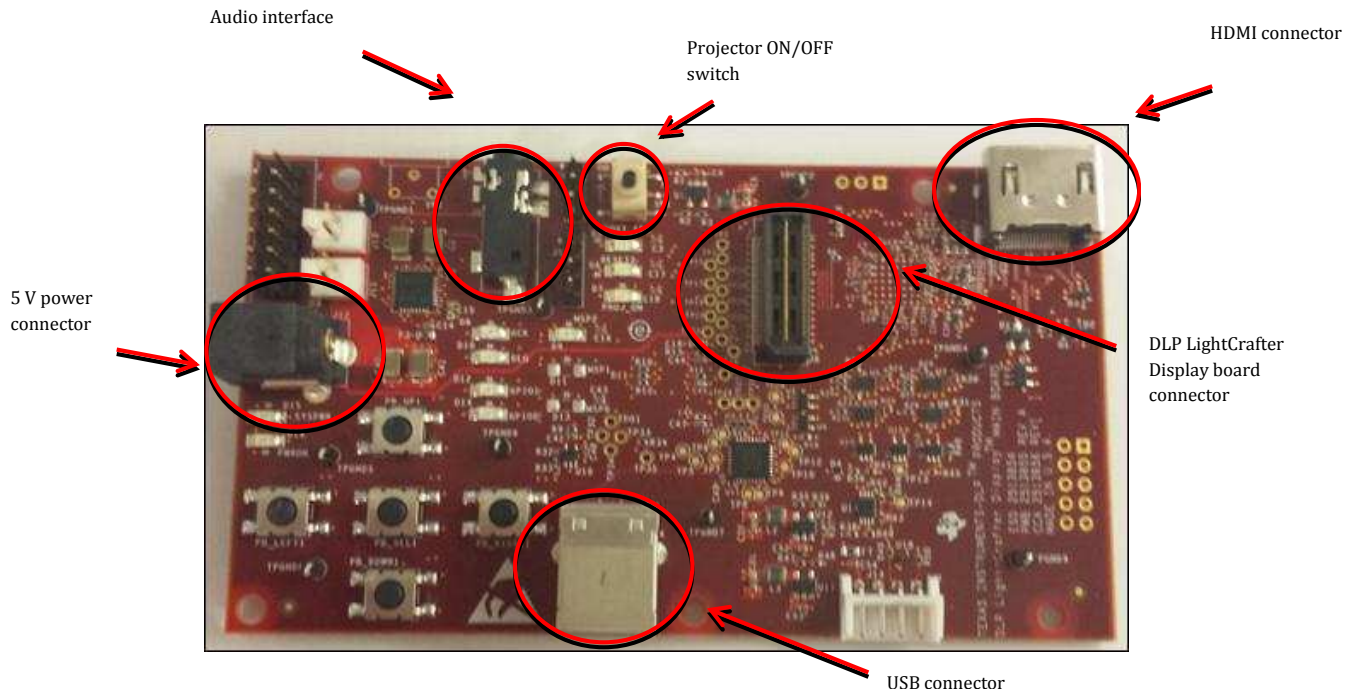
## 7 EVM Setup

The DLP LightCrafter™ Display 2010 EVM is composed of three parts:

- Main board
- DLP LightCrafter Display board
- Engine with LED connection and Flex cable

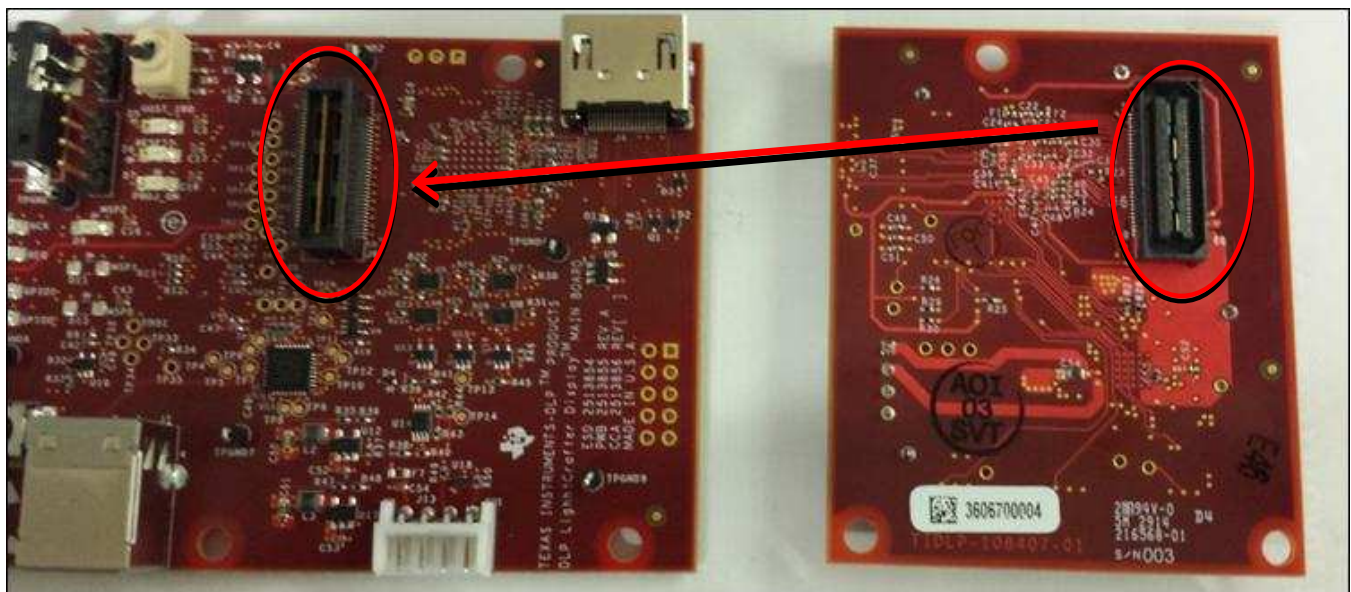
The main board contains the connector for the power supply, the USB connector to communicate to the DLP LightCrafter Display software, the HDMI, audio and the connector for the DLP LightCrafter Display board. The main board also contains the switch to turn on the projector in case the DLP LightCrafter Display board and the engine is connected. [Figure 6](#) shows the main connectors on the main board.





**Figure 6. DLP LightCrafter Display main board**

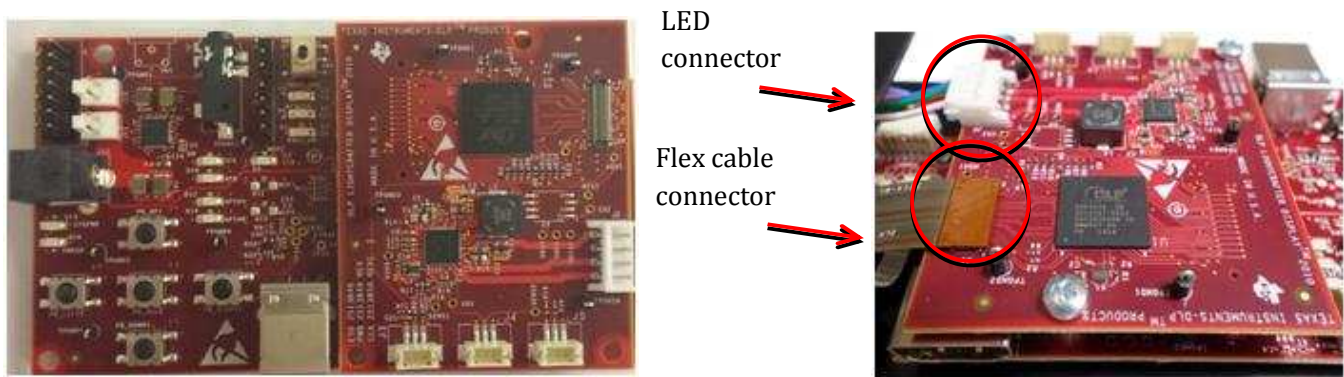
The DLP LightCrafter Display board has three main connectors: the LED connector, the Flex cable connector, and the main board connector. To connect the main board to the DLP LightCrafter Display board, refer to [Figure 7](#). Note that the main board connector on the DLP LightCrafter™ Display board is on the bottom while the LED and Flex cable connectors are on the top.



**Figure 7. Connection Main Board and DLP LightCrafter Display Board**

[Figure 8](#) shows the board connections.





**Figure 8. DLP LightCrafter Display**

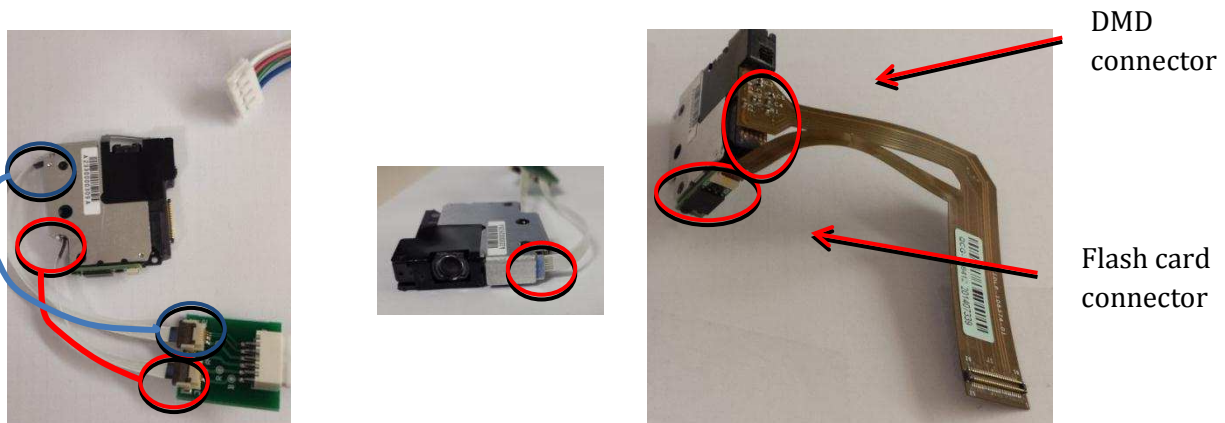
The engine requires four connections:

- two connections from the flex cable:
  - one for the DMD
  - one for the flash card mounted on the engine
- two connections from a small adapter board to ensure communication with the LEDs

Figure 9 shows the proper setup.

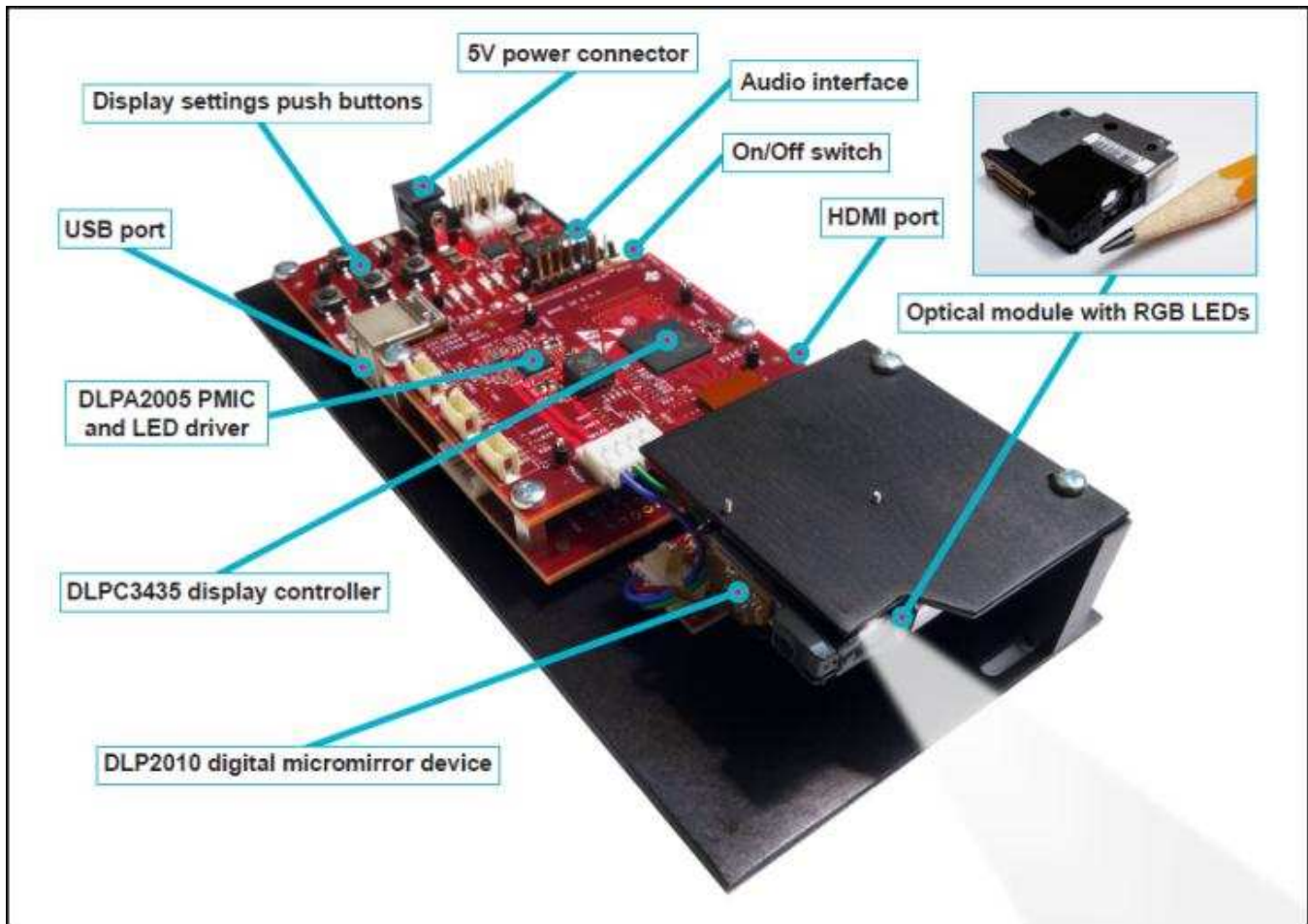
The pins of the flex cable connector are labeled with the pin numbers. Verify that the pin numbers match when connecting the flex cable.

To ensure the LED cables are connected correctly, use the colored circles to trace each cable to the right connection. Figure 9 shows how to verify the connection. .



**Figure 9. LED Connection and Flex Cable Connection**

Figure 10 shows the final setup of all components.



**Figure 10. DLP LightCrafter Display complete EVM**

Make sure that everything is setup correctly before continuing. Verify that the flex cable is connected correctly to the DMD and to the LightCrafter Display board.

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## Revision History

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

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### Changes from C Revision (February 2019) to D Revision Page

- Corrected pin mapping option listing from 3 to 1 in [Section 4](#)..... 5
- 

### Changes from B Revision (October 2015) to C Revision Page

- Added pin mapping option description in [Section 4](#) ..... 5
- 

### Changes from A Revision (October 2014) to B Revision Page

- Added *DLP Lightcrafter Display 2010 PCB Overview* section ..... 3
-

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