



## Description

The DLPC4420AEVM controller evaluation module (EVM), when combined with the DLP660TEEVM, DLP780TEEVM or DLP470TEEVM digital micromirror device (DMD) EVMs, can accelerate the prototyping time of DLP ultra high definition (UHD - 3840x2160) system over 2000 lumens. The DLPC4420AEVM provides a design for driving 4K UHD DMDs while allowing for testing of custom front end systems. The combination of the DLPC4420AEVM with any of these 4K UHD DMD EVMs can display SPLASH, test patterns or video from HDMI™ source on the DMD.

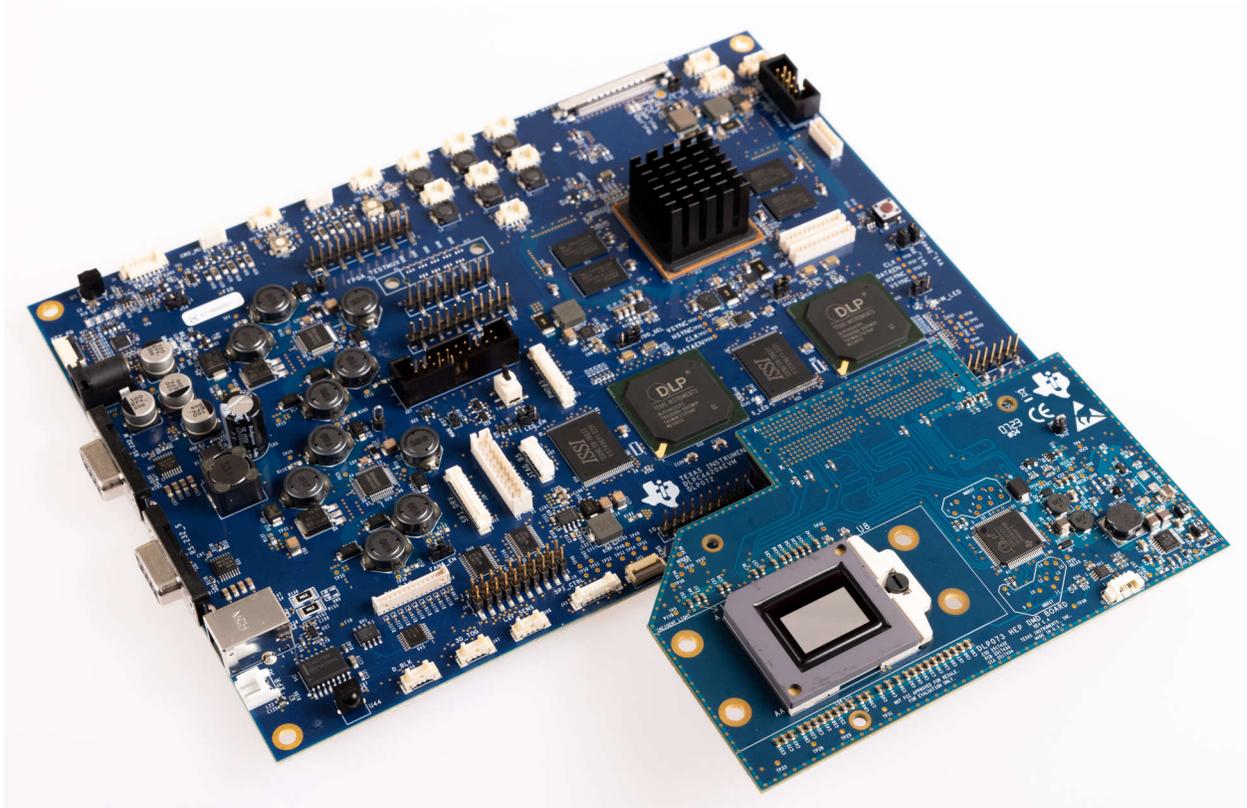
## Getting Started

1. Order [DLPC4420](#) chipset EVMs (controller and DMD) and an applicable power supply.

2. Read this User's Guide completely and the DLPC4420 Software Programmer's Guide.
3. Download the DLPC44xx-GUI and the DLPC4420EVM-SW.
4. Download the DMD EVM and the controller [EVM design files](#).

## Features

- Designed to be used with a 4K UHD DMD EVM
- Supports up to 4K UHD at 60 Hz or 1080p at 240 Hz
- Includes two DLPC4420 controllers, two DLPA100 controller PMIC and motor drivers, and an FPGA
- Power supply, optics, illumination source, and extension cables are not included
- Offers several interface options for USB, I2C and trigger inputs and outputs



DLP DLP780TEEVM and DLPC4420AEVM Evaluation Module

## 1 Evaluation Module Overview

This user's guide explains the hardware and software features of the DLP Products DLP660TEEVM, DLP470TEEVM, DLP780TEEVM and DLPC4420AEVM systems. The EVM architecture and connectors are described along with a quick start guide on how to operate the DLP660TEEVM, DLP470TEEVM, DLP780TEEVM and DLPC4420AEVM using the DLPC44xx-GUI. Specific DLP® chip details and operation can be found in related component documentation.

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### Note

Power supply, optics, illumination source, and extension cables are sold separately. See [Other Items Needed for Operation](#).

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### 1.1 Introduction

The DLP Products DLP660TEEVM, DLP470TEEVM, DLP780TEEVM and DLPC4420AEVM offer a reference design to enable faster development cycles for users of the DLPC4420 chips and allow evaluation of TI's DLP660TE, DLP470TE and DLP780TE UHD digital micromirror displays (DMDs). The three DMD EVMs (DLP660TEEVM, DLP470TEEVM and DLP780TEEVM) and one controller EVM (DLPC4420AEVM) are referred to as a chipset.

These evaluation kits bring together a set of components providing a great starting point to evaluate a UHD DLP system for:

- Laser TV
- Enterprise Projectors
- Digital Signage
- Gaming Systems
- Smart Projectors
- Stage Lighting Systems

### 1.2 Kit Contents

The DLP660TEEVM, DLP470TEEVM, DLP780TEEVM and DLPC4420AEVM are designed to be used in pairs. The DMD EVMs cannot operate without the Controller EVM, DLPC4420AEVM.

The three DMD EVMs have a board-mounted connector that mates with the DLPC4420AEVM controller board. DLPC4420AEVM includes all circuitry required to drive the DLP660TE, DLP470TE and DLP780TE display chip.

The DLPC4420AEVM includes two DLPC4420 controllers in primary-secondary mode, two DLPA100s which serve as the power management and motor drivers, and other system circuitry such as the Vx1 receiver and system fan control.

The DLPC4420AEVM can be programmed with one of the three DMD's firmware which is available on the DLPC4420 product page. This firmware allows the DLPC4420AEVM to drive the display chip. [Figure 1-1](#), [Figure 1-2](#), [Figure 1-3](#), and [Figure 1-4](#) show the top side of each EVM.

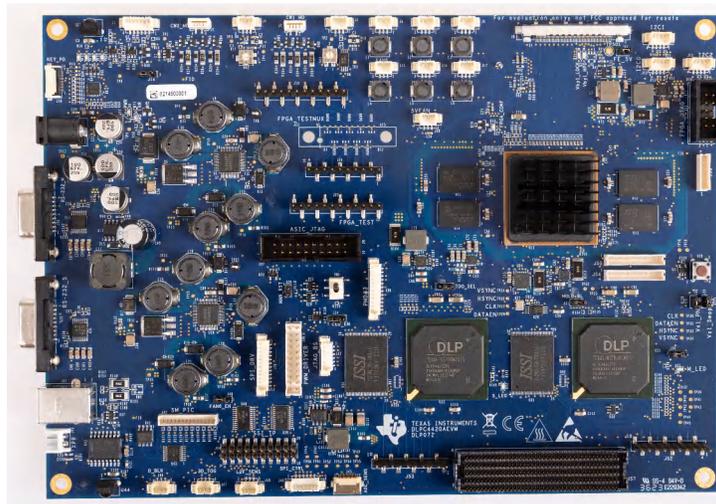


Figure 1-1. DLPC4420AEM

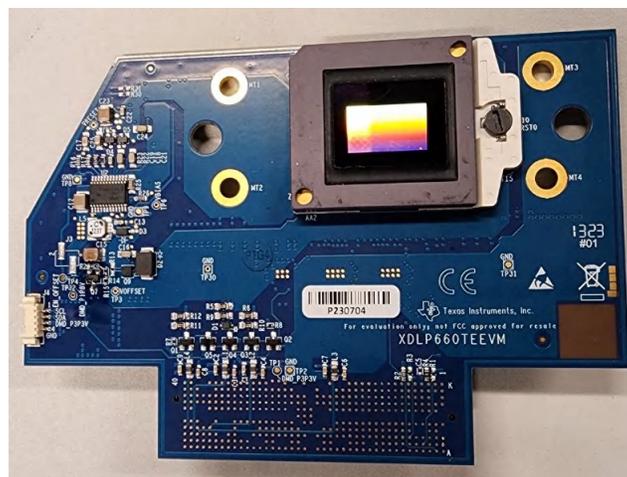


Figure 1-2. DLP660TEEM



Figure 1-3. DLP470TEEM

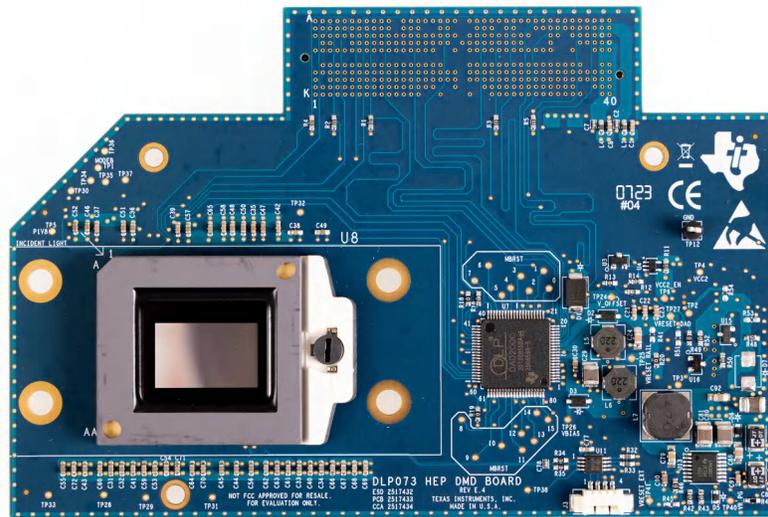


Figure 1-4. DLP780TEEVM

### 1.3 Specification

Table 1-1.

INPUT PARAMETERS	CONDITIONS	MIN	TYP	MAX	UNIT
$V_{dc}$	<a href="#">Section 2.1</a>	11.4	12	13.2	V
$I$				7	A

### 1.4 Device Information

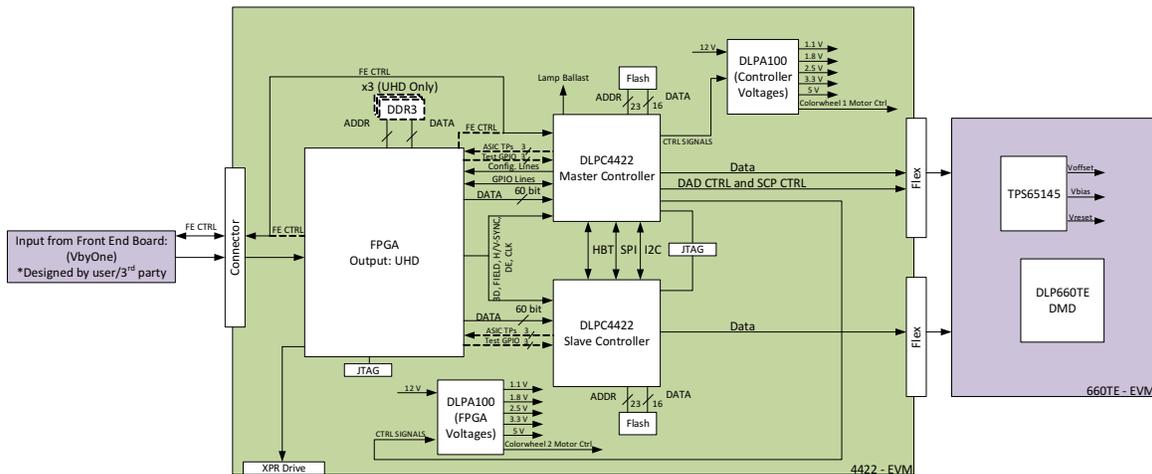
The DLP660TEEVM, DLP470TEEVM, DLP780TEEVM and DLPC4420AEVM contain the electronics required to drive either the DLP660TE, DLP470TE or DLP780TE DMD. The DLPC4420AEVM offers several interface options for USB, I2C, and trigger inputs and outputs.

[Table 1-2](#) shows the use of shared EVM designs. This guide relates to 4k UHD resolution DMDs only.

Table 1-2. 4K/UHD DMD EVMs

DMD Covered	Resolution	DLP EVM #
DLP780TE	4k/UHD	DLP099
DLP470TE	4k/UHD	DLP104
DLP660TE	4k/UHD	DLP080

The system block diagram [Figure 1-5](#) details the functionality and control when using the DLP660TEEVM and DLPC4420AEVM.



**Figure 1-5. EVM System Block Diagram**

The major components of the DLPC4420AEVM are:

- Two DLPC4420 controllers
- Two DPLA100 power management and motor driver chips
- FPGA used to split incoming Vx1 data for the two DLPC4420 controllers

The major components of the DLP660TEEVM are:

- DLP660TE 0.66-inch UHD DMD
- Connector designed to attach the DLP660TEEVM to the DLPC4420AEVM
- TPS65145 used to generate the DMD's reset voltages

The major components of the DLP470TEEVM are:

- DLP470TE 0.47-inch UHD DMD
- Connector designed to attach the DLP470TEEVM to the DLPC4420AEVM
- TPS65145 used to generate the DMD's reset voltages

The major components of the DLP780TEEVM are:

- DLP780TE 0.78-inch UHD DMD
- Connector designed to attach the DLP780TEEVM to the DLPC4420AEVM
- DPLA300 used to generate the DMD's reset voltages

### 1.5 Other Items Needed for Operation

The DLP660TEEVM, DLP470TEEVM, DLP780TEEVM and the DLPC4420AEVM are capable of displaying images on to the DMD. The EVMs are meant to accelerate initial system design. However, these EVMs do not ship with optics, illumination source, cables, power supplies, or additional hardware components. These are system parameters that are left for the user to design or provide:

- Power supply (See [Section 2.1.1](#))
- Mini-USB cable: A to B USB cable
- Optics
- Illumination module and source
- Front-End Vx1 Source capable of running at 600 MHz pixel clock

## 2 Hardware

### 2.1 Power Supply Requirements

#### 2.1.1 External Power Supply Requirements

The DLPC4420AEM does not include a power supply. The external power supply requirements are:

- Nominal voltage: 12-V DC -5%/+10%
- Maximum Output Current: 7 A
- DC connector size:
  - Inner diameter: 2.5 mm
  - Outer diameter: 5.5 mm
  - Shaft: 9.5-mm female, center positive
- Efficiency level: V
- A recommended power supply is
- [Digi-Key part number 993-1009-ND](#), or equivalent

#### Note

External Power Supply Regulatory Compliance Certifications: Recommend selection and use of an external power supply, which meets TI's required minimum electrical ratings in addition to complying with applicable regional product regulatory and safety certification requirements such as (by example) UL, CSA, VDE, CCC, PSE, and so forth.

### 2.2 Connections

This chapter introduces all the connections and test points available on the DLPC4420AEM, DLP660TEEM, DLP470TEEM, and DLP780TEEM.

#### 2.2.1 DLPC4420AEM Connections

Figure 2-1 depicts the switches and connectors with their respective locations. Note that neither cables nor the power supply is included with the module.

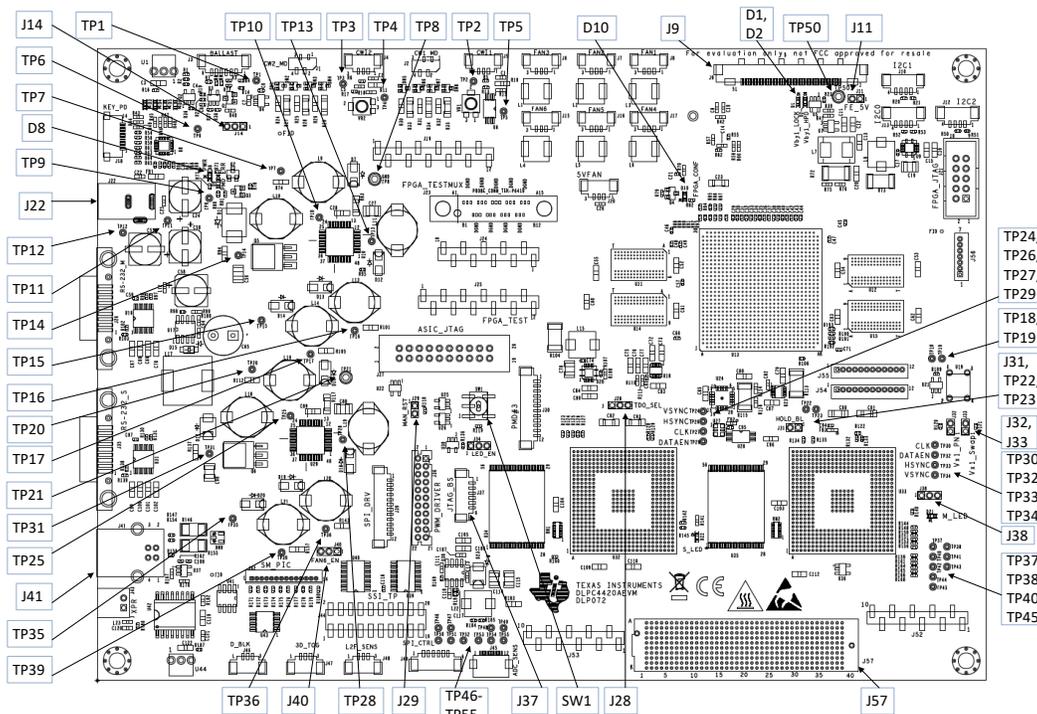


Figure 2-1. DLPC4420AEM Test Points and Connectors

### 2.2.1.1 DLPC4420AEVM Connectors

Reference Designator	Description	Physical Connection Type
J1	Colorwheel #2 motor drive	Cable
J2	Colorwheel #1 motor drive	Cable
J3	Lamp Ballast Control	Cable
J4	Colorwheel #2 Index Sensor	Cable
J5	Colorwheel #1 Index Sensor	Cable
J6	Fan #3	Cable
J7	Fan #2	Cable
J8	Fan #1	Cable
J9	V-By-One Input	Cable
J10	I2C1 Bus	Cable
J11	FE_12V	Jumper (short)
J12	I2C2 Bus	Cable
J13	I2C0 Bus	Cable
J14	Blue_LED_EN / Lamp Mode	Jumper selection
J15	FAN #6	Cable
J16	FAN #5	Cable
J17	FAN #4	Cable
J18	Keyboard Interface	Cable
J19	FPGA Testmux	Header
J20	5 V Fan	Cable
J21	FPGA_JTAG	Cable
J22	12 V Input	Power (Barrel)
J23	FPGA Testmux	Test Points
J24	FPGA Testmux	Header
J25	FPGA Test Points	Header
J26	RS_232_M (Primary)	Cable
J27	ASIC JTAG	Cable
J28	JTAG TDO1/2 Bus Selection	Jumper selection
J29	Manual Reset Jumper	Jumper (short)
J30	Optional DLP1000 #3 Header	Cable
J31	HOLD_BL	Jumper (short)
J32	Vx1 Swap PN	Jumper (short)
J33	Vx1 Swap Bit Order	Jumper (short)
J34	LED_EN	Jumper selection
J35	RS_232_S (Secondary)	Cable
J36	PWM SSI Driver I/F	Cable
J37	JTAG Boundary Scan	Cable
J38	ADC Sensor Interface	Jumper selection)
J39	SPI Driver and Control I/F	Cable
J40	FAN6_EN	Jumper selection
J41	Mini-USB	Cable
J42	SM_PIC (Actuator Test Points)	Cable
J43	XPR	Cable
J44	SSI_TSP	Test Points
J45	ADC Integrating Sensor Board I/F	Cable
J46	D_BLK	Cable

Reference Designator	Description	Physical Connection Type
J47	3D_TOG	Cable
J48	L2F_Sens	Cable
J49	SSI SPI Control	Cable
J52	4420 (Primary) Testpoints	Header
J53	4420 (Secondary) Testpoints	Header
J54	Actuator Interface	Cable
J55	Actuator Interface	Cable
J56	Actuator Interface	Cable
J57	FMC Connector	Cable

### 2.2.1.2 DLPC4420AEVM Test Points

Reference Designator	Description
TP1	LAMPLITZ_FLTR
TP2	CW1 Sense Input
TP3	CW2 Sense Input
TP4	CW_INDEX2
TP5	CW_INDEX1
TP6	LMPCTRL
TP7	P5V_M
TP8	GND
TP9	P12V
TP10	A1P8V_M
TP11	P12V
TP12	GND
TP13	CW_PWM1
TP14	P1P1V_M
TP15	P1P8V_M
TP16	P3P3V_M
TP17	P2P5V_M
TP18	ACT_SYNC_0
TP19	ACT_SYNC_1
TP20	P5V_S
TP21	GND
TP22	EXT_ARSTZ
TP23	MTR_ARSTZ
TP24	S_P1_VSYNC
TP25	A1P8V_S
TP26	S_P1_HSYNC
TP27	S_P_CLK1
TP28	CW_PWM2
TP29	S_P_DATAEN1
TP30	M_P_CLK1
TP31	P1P1V_S
TP32	M_P_DATAEN1
TP33	M_P1_HSYNC
TP34	M_P1_VSYNC
TP35	P1P8V_S

Reference Designator	Description
TP36	P3P3V_S
TP37	SSP0_CSZ0
TP38	DADSTB
TP39	P2P5V_S
TP40	SSP0_CSZ1
TP41	SSP0_RXD
TP42	SSP0_CSZ2
TP43	A_SSP0_CLK
TP44	SSP0_CSZ3
TP45	A_SSP0_TXD
TP46	LED_SCLK
TP47	LED_DIN
TP48	ADC_SCLK
TP49	ADC_SDO
TP50	LED_DOUT
TP51	LED_OE
TP52	LED_DIR
TP53	ADC_RST
TP54	ADC_SDIN
TP55	ADC_CSZ
TP500	GND



### 2.2.2.1 DLP660TEEVM Test Points

Reference Designator	Description
TP1	DMD_P3P3V
TP2	GND
TP3	VOFFSET
TP4	EN_OFFSET
TP5	VRESET
TP6	VBIAS
TP7	PG_OFFSET
TP8	GND
TP9	GND
TP10	MBRST0*
TP11	MBRST1*
TP12	MBRST2*
TP13	MBRST3*
TP14	MBRST4*
TP15	MBRST5*
TP16	MBRST6*
TP17	MBRST7*
TP18	MBRST8*
TP19	MBRST9*
TP20	MBRST10*
TP21	MBRST11*
TP22	MBRST12*
TP23	MBRST13*
TP24	MBRST15*
TP25	MVRST14*
TP26	N/A
TP27	N/A
TP28	N/A
TP29	N/A
TP30	GND
TP31	GND
TP32	DMD_P1P8V

#### Note

(\*) - These signals are not internally connected in the DMD

### 2.2.2.2 DLP660TEEVM Connectors

Reference Designator	Description	Physical Connection Type
J4	I2C	Cable
J500	FMC Connector	Cable



### 2.2.3.1 DLP470TEEVM Test Points

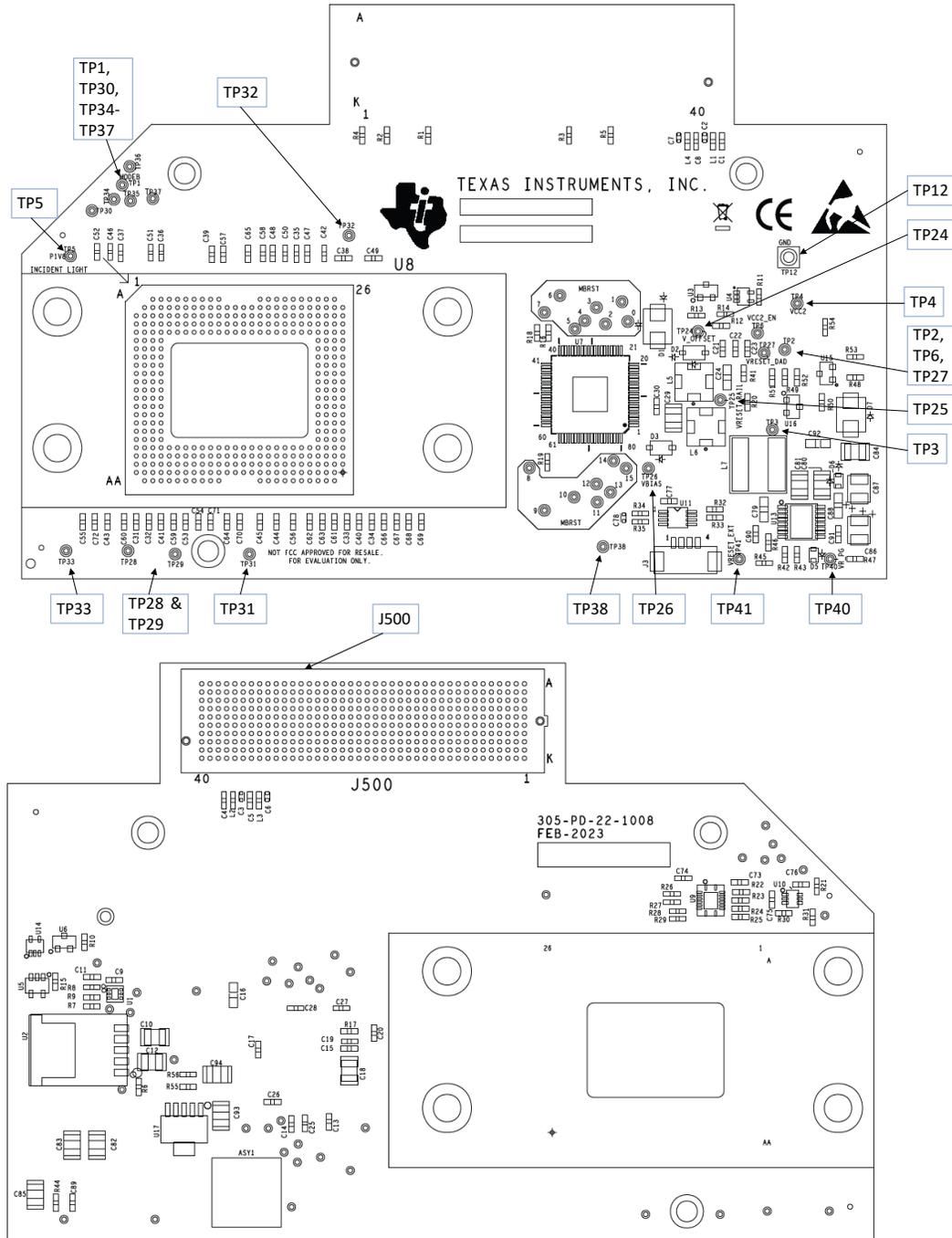
Reference Designator	Description
TP1	DMD_P3P3V
TP2	GND
TP3	DMD_P1P8V
TP4	VOFFSET
TP5	EN_OFFSET
TP6	VRESET
TP7	VBIAS
TP8	PG_OFFSET
TP9	GND
TP10	GND
TP23	BIST_A
TP24	BIST_B
TP25	BIST_C
TP26	BIST_D
TP27	GND
TP28	GND

### 2.2.3.2 DLP470TEEVM Connectors

Reference Designator	Description	Physical Connection Type
J4	I2C	Cable
J500	FMC Connector	Cable

### 2.2.4 DLP780TEEVM Connections

Figure 2-4 depicts the switches and connectors with their respective locations.



**Figure 2-4. DLP780TEEVM Test Points and Connectors**

### 2.2.4.1 DLP780TEEVM Test Points

Reference Designator	Description
TP1	DMD Mode
TP2	DMD_P3V3
TP3	DMD_P3V3
TP4	VCC2
TP5	DMD_P1V8
TP6	VCC2_EN
TP7	MBRST15
TP8	MBRST14
TP9	MBRST13
TP10	MBRST12
TP11	MBRST11
TP12	GND
TP13	MBRST10
TP14	MBRST9
TP15	MBRST8
TP16	MBRST7
TP17	MBRST6
TP18	MBRST5
TP19	MBRST4
TP20	MBRST3
TP21	MBRST2
TP22	MBRST1
TP23	MBRST0
TP24	V_OFFSET
TP25	VRESET_RAIL
TP26	VBIAS
TP27	VRESET_DAD
TP30	PROG_FUSE_EN
TP33	SCP_TEST_MUX
TP37	TEMP_ALERT
TP38	THERMAL_FLAG
TP41	VRESET_EXT

### 2.2.4.2 DLP780TEEVM Connectors

Reference Designator	Description	Physical Connection Type
J3	I2C	Cable
J500	FMC Connector	Cable

### 2.3 Connecting the DLP660TEEVM, DLP470TEEVM, or DLP780TEEVM to the DLPC4420AEVM

Before connecting the DLP660TEEVM, DLP470TEEVM or DLP780TEEVM to the DLPC4420AEVM, identify the male connector on the back of the DLP660TEEVM, DLP470TEEVM or DLP780TEEVM.

The connectors are keyed by design and must follow an orientation to mate with the female connector (J57) located on the DLPC4420AEVM.

The EVM looks like [Figure 2-5](#) after the FMC cables have been properly connected between the DLP660TEEVM and the DLPC4420AEVM. The process is the same for use with the DLP470TEEVM and DLP780TEEVM.

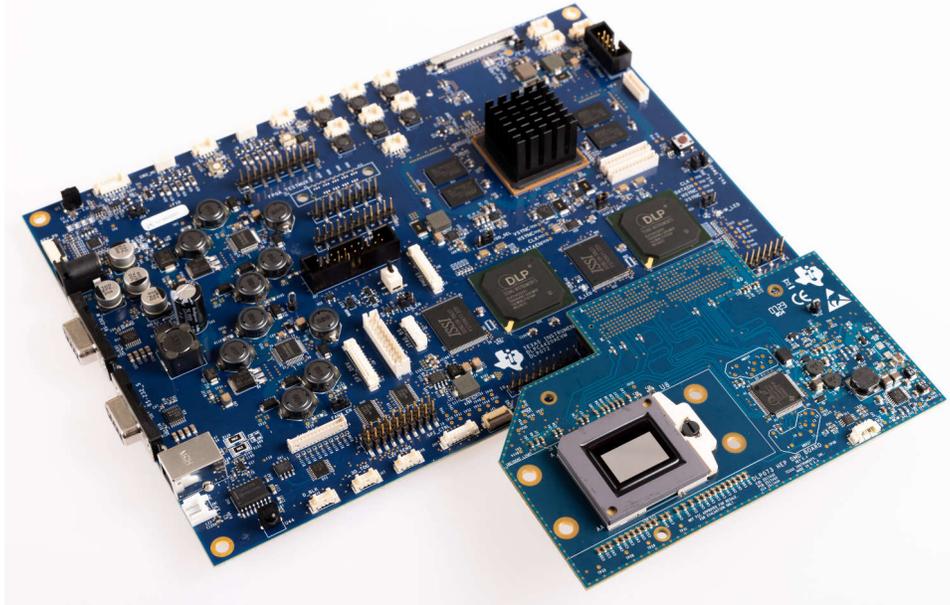


Figure 2-5. EVMs Connected

## 3 Software

### 3.1 Quick Start

This chapter offers a quick start guide of how to:

- Download the associated software
- Connect the DLP660TEEVM, DLP470TEEVM or DLP780TEEVM to the DLPC4420AEVM
- Power up the DLPC4420AEVM
- Program the DLPC4420AEVM to display a SPLASH image on the DMD
- Troubleshoot issues

#### 3.1.1 Downloading the Software

Before programming the DLPC4420AEVM, make sure the DLPC44xx GUI and DMD firmware have both been downloaded to the PC. The DLPC44xx GUI allows for operation of the EVM and the DMD firmware is required according to DMD being utilized. If the DLP660TEEVM is being used with the DLPC4420AEVM, then the DLP660TE firmware is needed. Otherwise, if the DLP470TEEVM is used, then the DLP470TE firmware is needed.

The DMD firmware and DLPC44xx GUI can be found under the [Software Development](#) tab on the product pages on TI.com. Please see the product pages for the [DLP660TE](#), [DLP470TE](#), [DLP780TE](#), and [DLPC4420](#).

#### 3.1.2 Powering-up the DLPC4420AEVM and Preparing for the DLPC4420AEVM to be Programmed

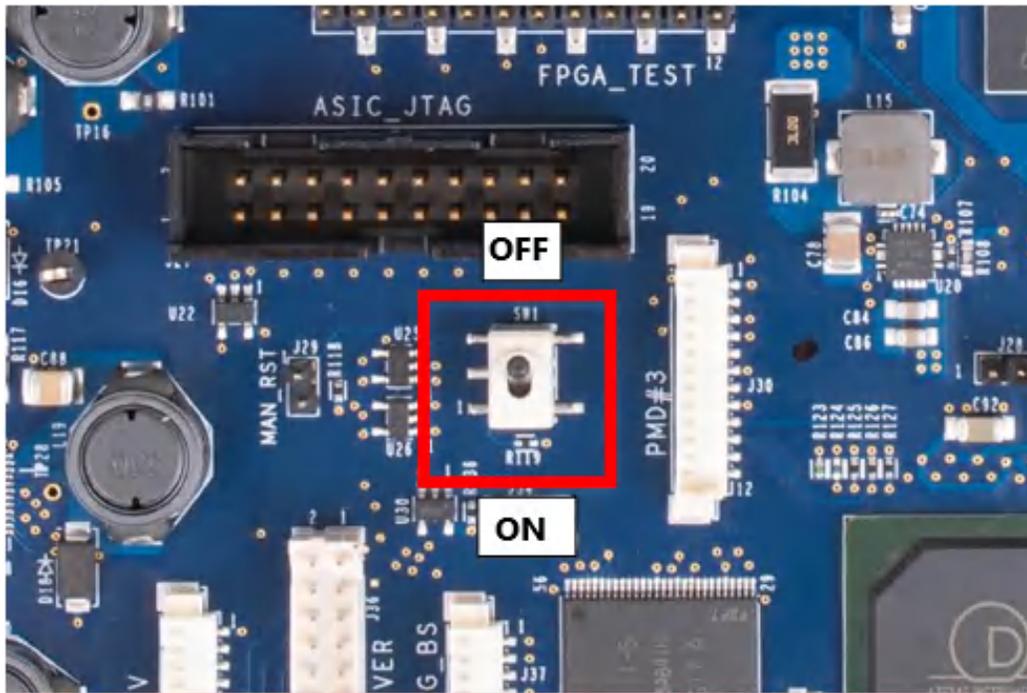
Before powering up the EVM, make sure the included DLPC4420AEVM jumpers are in the correct positions. The jumper locations are listed in [Table 3-1](#).

**Table 3-1. Reference Designators**

Jumper	Description (Bold Indicates Default Position)
J11 - Front end 12 V	<b>Uninstalled - main board is powered from the AC adapter</b> Installed - Front end board provides power to main board
J14 - Blue LED enable or lamp ballast	Pins 1,2 connected Blue LED Enable <b>Pins 2,3 connected Lamp mode</b>
J28 - TDO1 or TDO2	Pins 1,2 connected TDI in to secondary is from TDO1 from Primary <b>Pins 2, 3 connected TDI in to secondary is from TDO2 from Primary</b>
J29 - Manual reset	<b>Uninstalled - Normal operation</b> Installed - Hold in reset
J31 - Hold in boot loader	<b>Uninstalled - Normal operation</b> Installed - Hold in boot loader
J32 - Vx1 Swap P/N	Uninstalled - Swapping P and N <b>Installed - Not swapping P and N</b>
J33 - Vx1 swap bit order	Uninstalled - Swapping Bit Order <b>Installed - Not swapping bit order</b>
J34 - LED enable invert	<b>Pins 1, 2 connected LED_EN inverted</b> Pins 2, 3 connected LED_EN not inverted
J38 - Light to frequency sensor or ADC integrating sensor	<b>Pins 1,2 connected ADC integrating sensor</b> Pins 2,3 connected Comparator Sensor
J40 - High current Fan 5 or Fan 6	Pins 1,2 connected for high current fan 5 <b>Pins 2, 3 connected for fan 6</b>

Jumper J31 is the *Hold BL* jumper. This jumper is used to put the DLPC4420AEVM into boot loader mode, which allows the DLPC4420 controllers to be programmed. Connect this jumper to prepare the DLPC4420AEVM to be programmed.

To power up the DLPC4420AEVM, a 12 V, 5 A power supply is needed. Make sure the power supply is functional and the switch SW1 on the EVM is set to off before connecting the power supply to the EVM. Connecting the power supply when the switch is in the off position can prevent damage to the DLPC4420AEVM from poor power connections. The image below shows SW1 in the on position.



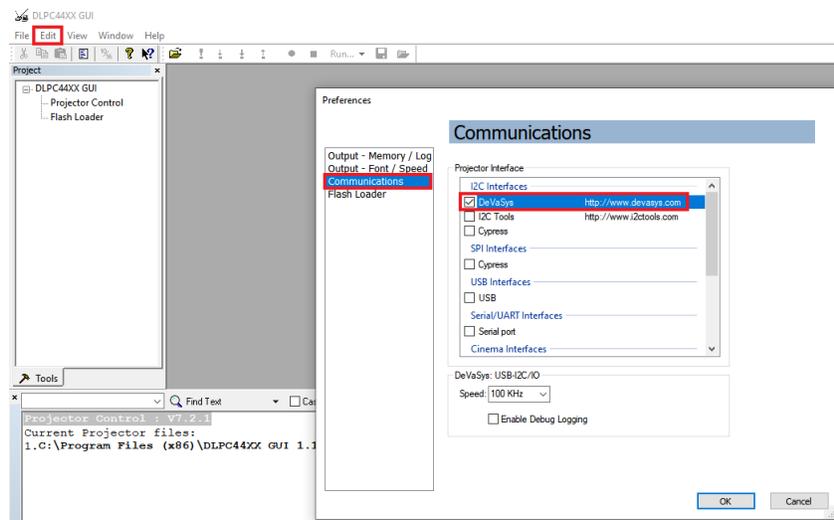
**Figure 3-1. ON/OFF Switch**

Once the power supply has been connected to the DLPC4420AEVM, the switch SW1 can be flipped to the *on* position. You can then plug in the USB cable into the board to prepare for programming the board.

### 3.1.3 Programming the DLPC4420AEVM and Displaying a SPLASH Image

Follow these steps to download and configure the DLPC44xx GUI:

1. The Projector Control (.projector) and Firmware binary(.img) files are located in the install directory. The same procedure applies to the DLP470TEEVM and DLP780TEEVM with the appropriate firmware.
2. Setting up Communication Preferences:
  - a. DLPC44xx GUI supports USB and I2C communication. To change these settings, please go to Edit->Preferences->Communication.

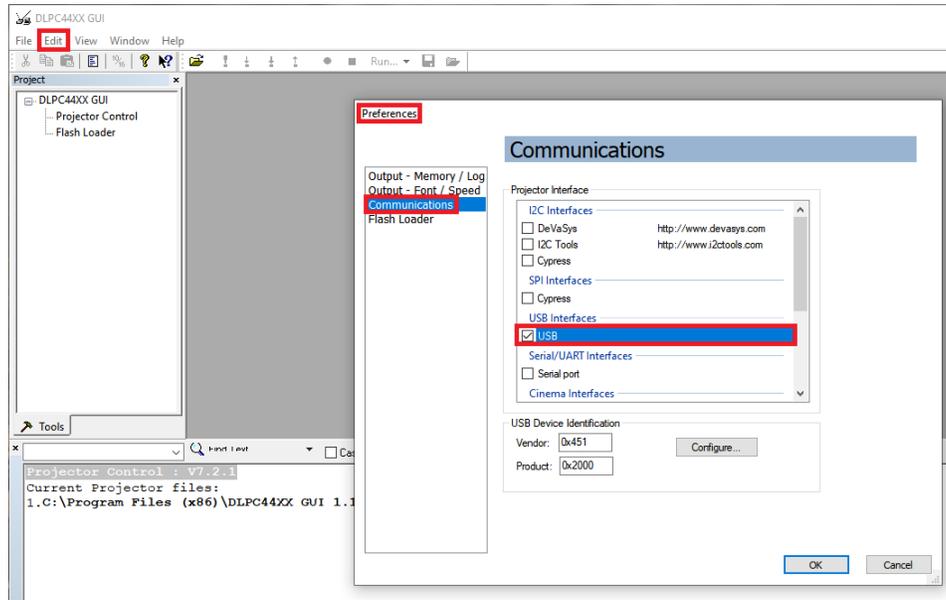


**Figure 3-2. DeVaSys Communication Configuration**

- b. For USB, please select the USB interface.

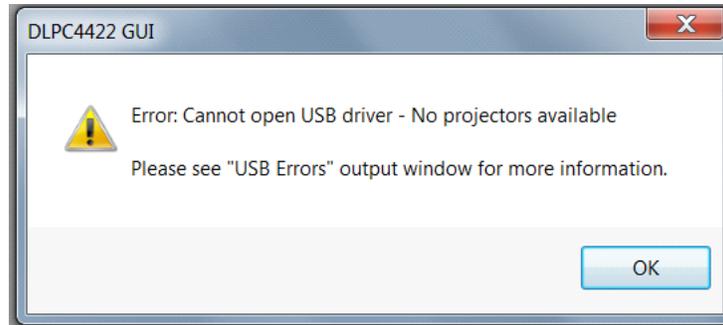
**Note**

USB is the preferred method to download the firmware flash image to the projector as USB is much faster than I2C.



**Figure 3-3. USB Communication Configuration**

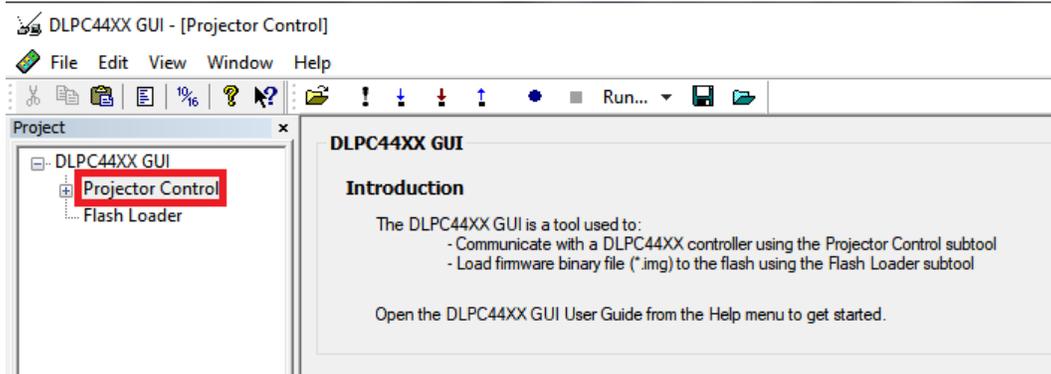
- c. An error message can appear saying the USB driver cannot be opened. This is expected, as TI has not yet enabled communication on the board. Click OK on this error.



**Figure 3-4. Error Message**

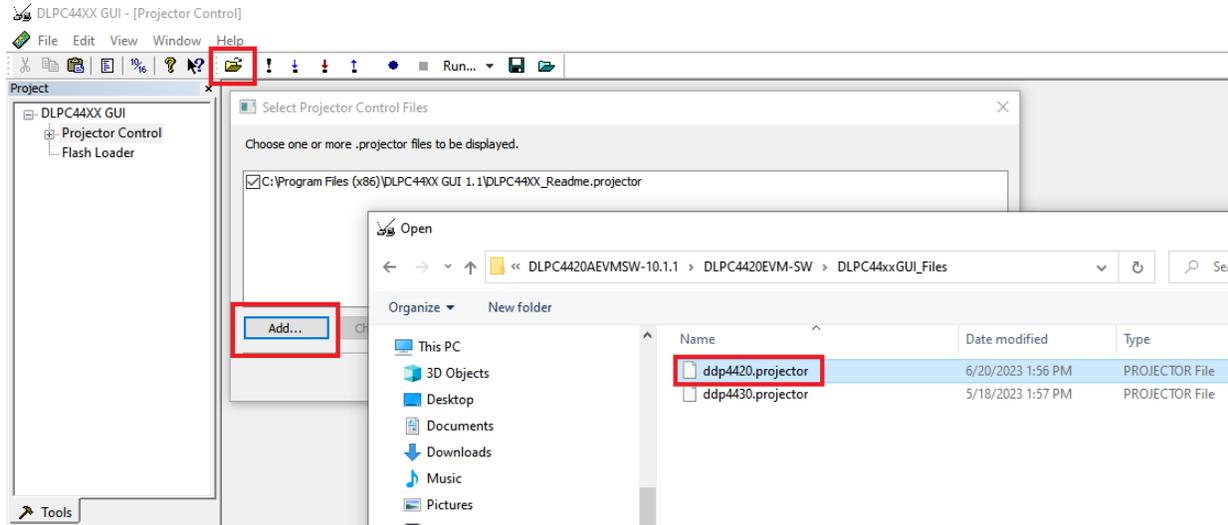
3. Projector Control Configuration:

- a. Run the DLPC44xx GUI tool and select the Projector Control sub-tool.



**Figure 3-5. Projector Control Menu**

- b. Select *Open Projector File* then select *Add*. Navigate to the .projector file location installed in step 1.

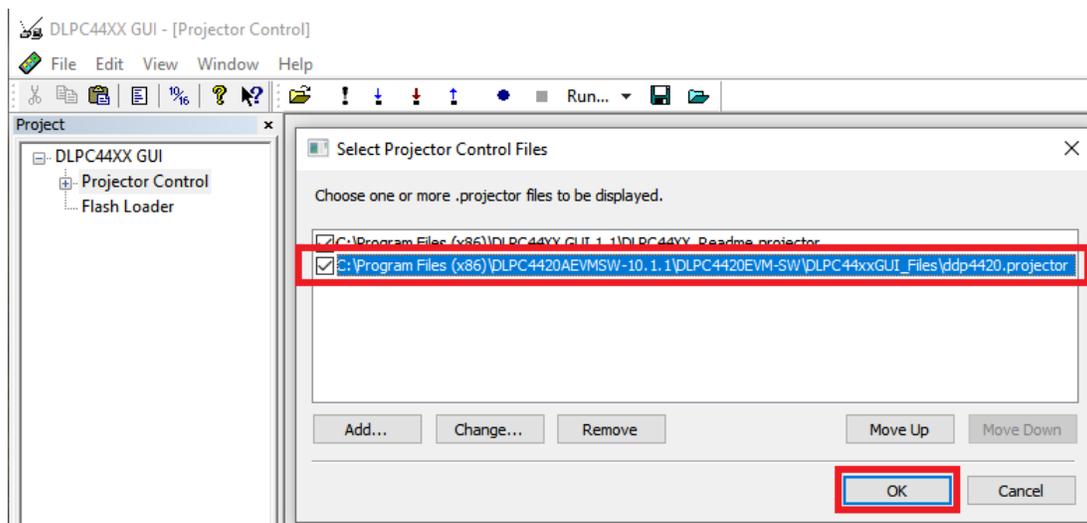


**Figure 3-6. Adding DLPC4420 Projector Control File**

- c. Make sure the desired Projector Control file is checked, then select OK.

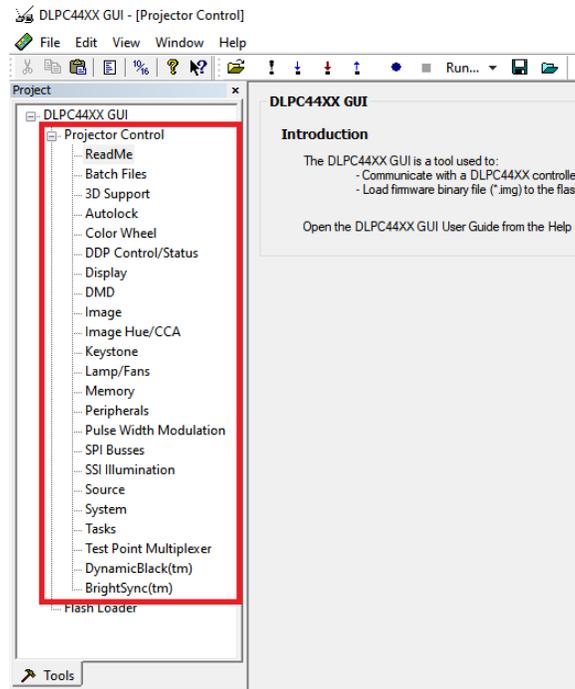
**Note**

If the user wants to use one Projector Control file at a time, then deselect the files to hide before selecting OK.



**Figure 3-7. Projector Control File for the Chosen Chipset**

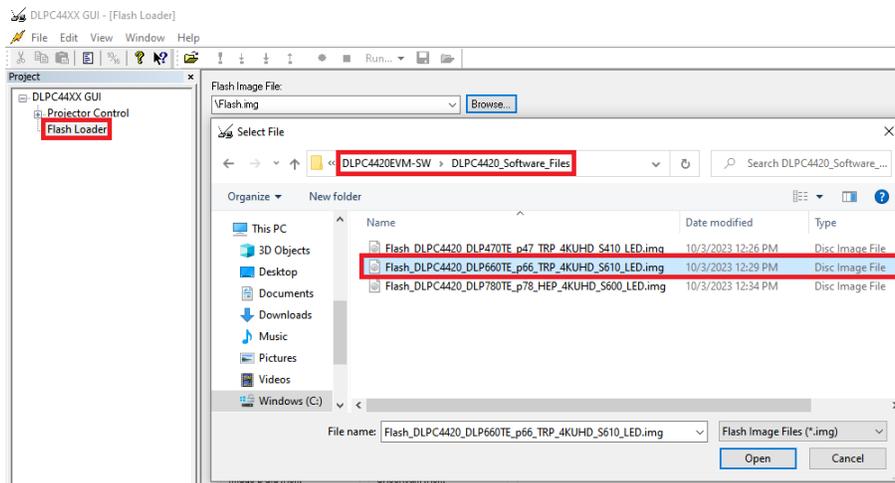
- d. Once this file is loaded, the user can navigate through the pages to control a DLPC4420 controller.



**Figure 3-8. DLPC4420 Projector Control Menu**

4. Flash Loader Configuration:

- a. Select the Flash Loader sub-tool, and then select the Browse button. After navigating to the installation directory, navigate to the *DLPC4420\_Software\_Files* folder and select the “Flash\_DLPC4420\_DLP660TE\_p66\_TRP\_4KUHD\_S610\_LED.img” file and click on *open*.



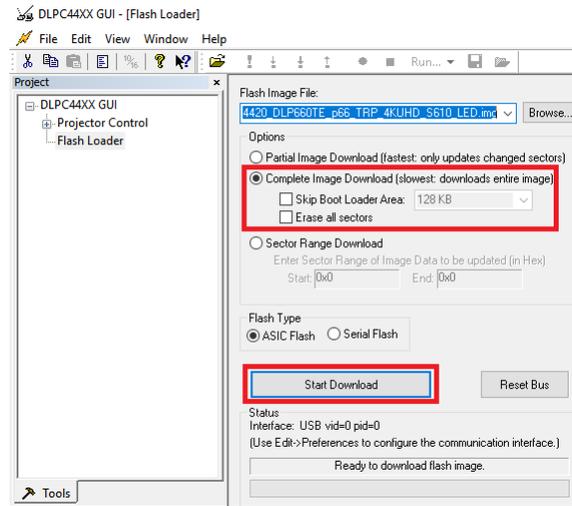
**Figure 3-9. Loading the Flash Image**

- b. Select *Complete Image Download* for first time download. By default, the flash has the boot loader pre-loaded; uncheck the *Skip Boot Loader Area*.

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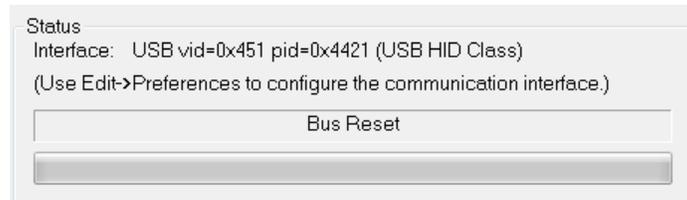
Check *Skip Boot Loader Area* only if the bootloader needs to be upgraded.

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**Figure 3-10. Downloading Image onto the EVM**

- c. Connect DLPC4420AEVM to PC via USB. Make sure USB communication capability by clicking *Reset Bus* on the bootloader menu in the DLPC44xx GUI. The *Status* field appears as follows:

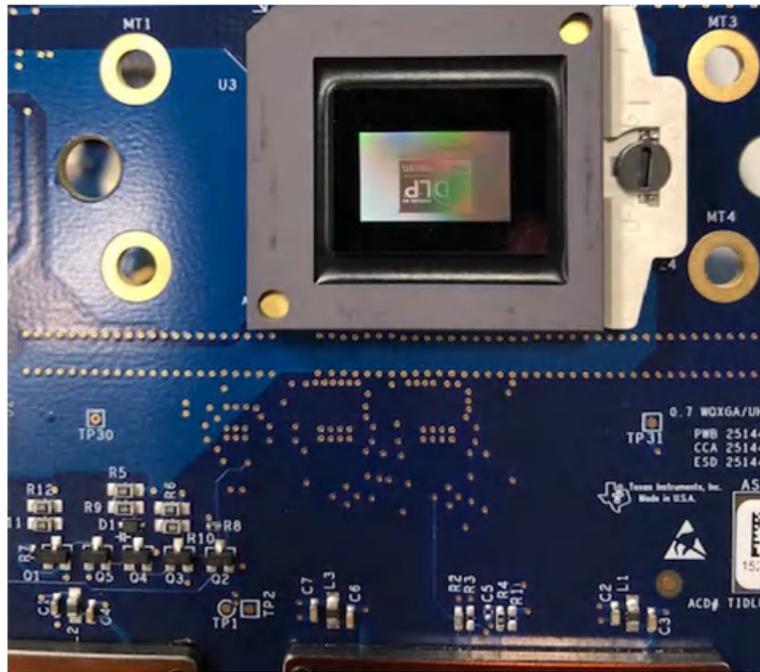


**Figure 3-11. Communication Between GUI and EVMs**

#### Note

If there is an issue with USB communication, then turn off DLPC4420AEVM and disconnect then reconnect USB cable and power on board.

- d. Select *Start Download* to begin. The loading process takes between 5 and 10 minutes.
- e. After the download has completed, switch SW1 to *off* and switch the power to the unit under test (UUT) off. Remove the jumper on J31 from the DLPC4420AEVM board.
- f. After removing the jumper, re-enable power to the DLPC4420AEVM. Switch SW1 to the *On* position. A Red LED appears after a few seconds. The Red LED shuts off and a green LED begins blinking. After the blinking LED appears, the DLP Texas Instruments logo is visible on the DMD for a few seconds and appear as or similar to what is seen in [Figure 3-12](#).



**Figure 3-12. Splash Image Displayed on DMD**

Turn the switch back to the *off* position before connecting the USB cable to DLPC4420AEVM. The power supply does not have to be disconnected before connecting the USB cable. Once the USB cable is connected to the DLPC4420AEVM (and the PC), turn the switch on the DLPC4420AEVM to the *on* position.

### 3.1.4 JTAG Flash Programming

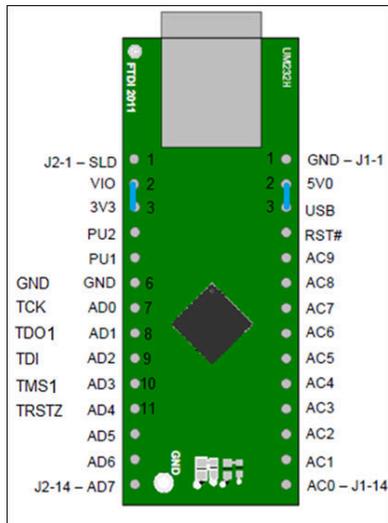
The JTAG Programmer Tool is included in the DLPC4420EVM-SW bundle, and allows a user to program the bootloader image into the flash using the JTAG boundary scan connector if, for example, the bootloader becomes corrupted and the board is rendered inoperable. The tool can also be used for updating the entire firmware image. Programming the entire firmware image using this method takes a long time and is suggested to program only the bootloader using this method. Following, the DLPC44xx GUI with a USB connection to upload the entire firmware image. The following steps are for programming only the bootloader image.

The JTAG Programmer Tool requires the UM232H module with modifications, which is manufactured by Future Technology Devices International Ltd (FTDI Chip), . The UM232H module can be purchased from Digi-key with the following part number: 768-1103-ND. The driver can be downloaded from the FTDI website ([www.ftdichip.com](http://www.ftdichip.com)). Select the VCP CDM WHQL Certified driver for Windows.

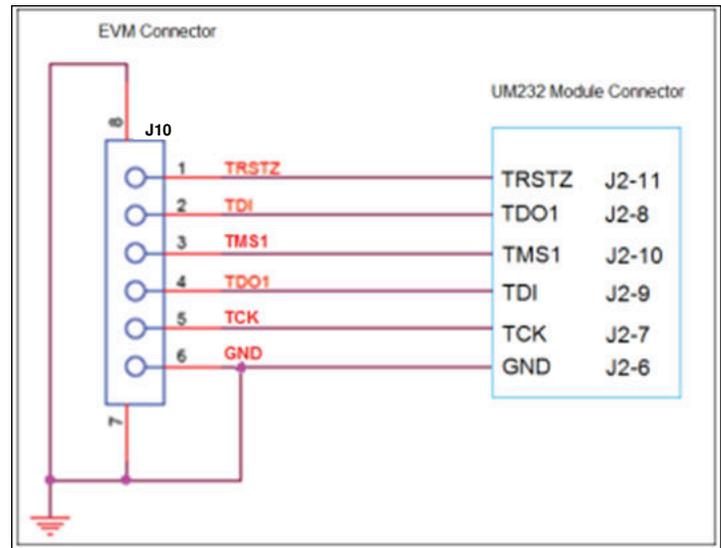
Make the following modifications to the UM232H and use [Figure 3-13](#) and [Figure 3-14](#) as a guide.

**Table 3-2. Connection Details**

UM232H Reference	Description	Connection Type
J1 Bus Power Configuration	Short J1 PIN #2 and PIN # 3	SYS POWER
J2 Bus Power Configuration	Short J2 PIN #2 and PIN #3	I/O POWER
J2-6	GND	POWER
J2-7	TCK	OUTPUT
J2-8	TDO1	OUTPUT
J2-9	TDI	INPUT
J2-10	TMS1	OUTPUT
J2-11	TRSTZ	OUTPUT



**Figure 3-13. UM232H Module**



**Figure 3-14. UM232H Wiring Diagram**

Choose the driver found in the CDM WHQL Certified zip folder and allow driver installation to complete. Install a jumper at J31 on the DLPC4420AEVM and connect the JTAG signals at J37 on the DLPC4420AEVM to the UM232H module as shown in [Figure 3-14](#). Finally, connect the UM232H to the PC with USB cable.

#### Note

The JTAG programmer has a copy of the FlashDeviceParameters.txt file, which is located in the DLPC4420EVM-SW\JTAG\_Programmer\_Tool\DLPC44xx-JTAG directory of the DLPC4420AEVMSW-10.1.1 bundle. See [Section 3.1.5](#) for instructions on how to edit this file to match the flash. If the user has already made changes to the FlashDeviceParameters.txt file in the DLPC4420-SW\DLPC44xxGUI\_Files directory that work with the GUI, then the user can copy that file to the DLPC4420EVM-SW\JTAG\_Programmer\_Tool\DLPC44xx-JTAG directory.

Please see the 'JTAG\_Bootloader\_Programming\_Guide.pdf' within the DLPC4420EVM-SW\JTAG\_Programmer\_Tool directory or follow the below instructions.

Start the Flash Programmer program and select the BoardFile.brd and the bootloader.bin included the install folder. Select USB as communication method from the Settings menu.

Power-up the EVM board and click the *Detect Chain* tool button. The tool detects the DLPC4420 in JTAG chain. On the EVM notice the **Green** LED (D8) lights up to confirm the DLPC4420 is currently connected.

On the Flash Programmer program, click the *Flash Info* button and confirm the correct flash part is detected by the tool. Using the *Flash Erase* button select the first sectors (to cover first 128 kilobytes) and erase these sectors.

Once sector erase is complete, set the *Start Address* (HEX) to 0x00000000 and set the *Size* (HEX) to 0x20000. Then click the *Program Flash* button, and then wait until write is complete.

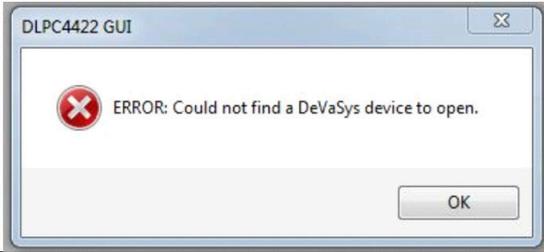
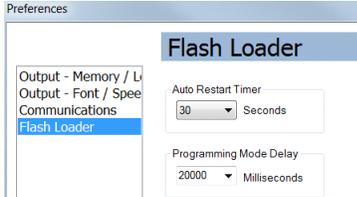
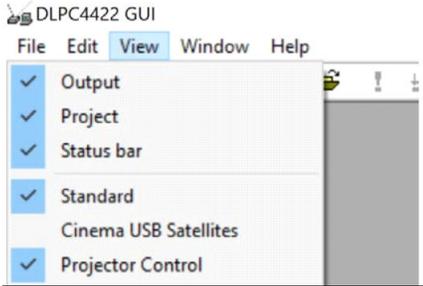
#### Note

Make sure that verify is 100% complete!

Then, remove the UM232H connection at J37 and jumper at J31. Cycle the board power to the EVM. Finally, plug in a USB cable between the EVM and the PC and allow the PC to detect the EVM USB connection.



### 3.1.6 Troubleshooting

Problem	Possible Resolutions
<p style="text-align: center;">USB Communication Error</p>  <p style="text-align: center;"><b>Figure 3-16. USB Communication Error</b></p>	<p>Verify the correct communication settings have been applied. Make sure the USB cable is connected both to the projector and computer.</p>
<p style="text-align: center;">I2C communication error</p>  <p style="text-align: center;"><b>Figure 3-17. I2C communication error</b></p>	<p>Verify the correct communication settings have been applied. Make sure a DeVasys box and the appropriate USB and I2C cables are connected.</p>
<p style="text-align: center;">Programming Mode error</p>  <p style="text-align: center;"><b>Figure 3-18. Programming Mode error</b></p>	<p>Check the connection settings and try again.</p> <p style="text-align: center;"><b>Note</b></p> <p>If this occurs only occasionally, then increase the programming delay to 20000 ms.</p>  <p style="text-align: center;"><b>Figure 3-19. Device Programming Delay Increase</b></p>
<p style="text-align: center;">Tool bars or panels missing</p>	 <p style="text-align: center;"><b>Figure 3-20. Tool Bar and Panel Display Settings</b></p>

## 4 Hardware Design Files

### 4.1 Schematics

Please see design files referenced in controller or associated DMD on the product page of [DLPC4420AEVM](#).

### 4.2 PCB Layouts

Please see design files referenced in controller or associated DMD on the product page of [DLPC4420AEVM](#).

### 4.3 Bill of Materials (BOM)

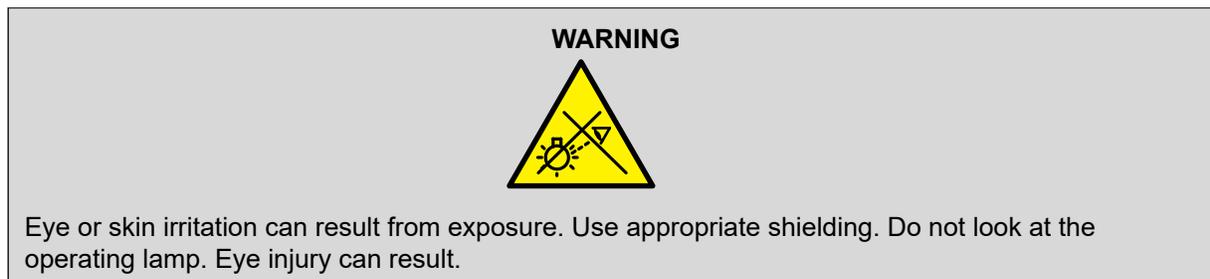
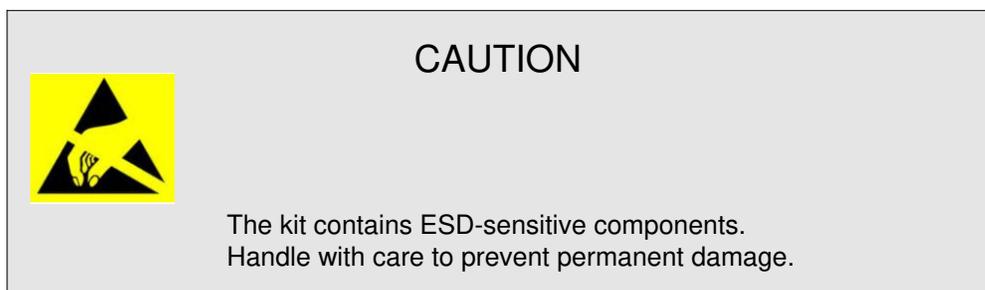
Please see design files referenced in controller or associated DMD on the product page of [DLPC4420AEVM](#).

## 5 Additional Information

### 5.1 If You Need Assistance

Refer to the [DLP E2E Community support forums](#).

### 5.2 Caution Labels



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## 6 Related Documentation from Texas Instruments

DLP660TE Data Sheet: DLP660TE Digital Micromirror Device (DMD), [DLPS037](#)

DLP470TE Data Sheet: DLP470TE Digital Micromirror Device (DMD), [DLPS037](#)

DLP780TE Data Sheet: DLP780TE Digital Micromirror Device (DMD), [DLPS221](#)

DLPC4420 Data Sheet: DLPC4420 DLP Display Controller, [DLPS222](#)

DLPA100 Data Sheet: DLPA100 Power Management and Motor Driver, [DLPS040](#)

DLPA300 Data Sheet: DLPA300 DLP DMD Driver, [DLPS227](#)

TPS65145 Data Sheet: TPS65145 Triple Output LCD Supply with Linear Regulator and Power, [DLPS053](#)

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