Technical Article

Getting Started with DLP-Based Projector System Selection

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This article focuses on the use of DLP products in projectors and introduces key devices of the overall system.

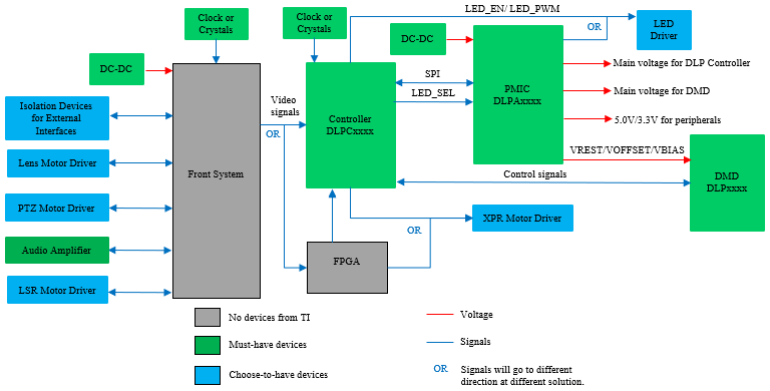

Figure 1. Projector System Block Diagram

As shown in Figure 1, the main components of a projector system include: the front-end streaming chip, the DLP controller, the PMIC, and the DMD. The DLP controller receives video signals transmitted from the front-end streaming chip and converts them into DMD control signals to enable image display. The part numbers of these controllers start with "DLPC". The PMIC primarily supplies the operating voltages required by the DLP controller and the DMD, and guarantees that the power-up sequencing of all voltages is within their required ranges. Most PMICs also integrate an LED drive section. The part numbers for them start with "DLPA". The DMD, a MEMS device, is the most important part for optical imaging in the entire projector system, with part numbers starting with "DLP". Each DMD typically has a specific DLP controller that it is designed to work with. The table below lists the most common DLP chipset solutions by product category.

343x series

The 343x series products can be optionally used with the DLPA200x and DLPA300x, with the difference between these PMICs being the amount of LED current that they can drive. The DLPA2000, DLPA2005, DLPA3000, and DLPA3005 can output maximum LED drive currents of 750mA, 1.3A, 6A, and 32A, respectively.

Resolution	Controller	DMD	DLPA2000	DLPA2005	DLPA3000	DLPA3005	XPR(2)	Suggested Brightness (lm)
720p (1280*720)	DLPC3421	DLP160CP	✓	✓	✓		✓	150
	DLPC3438	DLP3010	✓	✓	✓	✓		700
1080p (1920*1080)	DLPC3436	DLP230NP	✓	✓	✓	✓	✓	500
	DLPC3426	DLP230NPSE			✓	✓	✓	350
	DLPC3437(1)	DLP3310			✓	✓	✓	1000
	DLPC3439(1)	DLP4710			✓	✓		1600

(1) Both the DLPC3437 and DLPC3439 implementations require two controllers to achieve the resolutions shown, and additional FPGAs are needed for video signal processing.

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(2) The implementations marked as requiring XPR must be paired with galvos to achieve the resolutions listed in the table, and additional FPGAs are required to drive the galvos.

x54x series

The x54x series products can be optionally paired with the DLPA3005 or alternative discrete DCDC and LED driver components.

Resolution	Controller	DMD	No PMIC	DLPA3005	XPR[1]	Suggested Brightness (lm)
4K (3840*2160)	DLPC6540	DLP471TP	✓	✓	✓	1600
	DLPC3270	DLP471TPSE	✓	✓	✓	1000
	DLPC7540	DLP472TE	✓	✓	✓	6000

(1) The implementations marked as requiring XPR must be used with galvos to achieve the resolutions listed in the table. The x54x series products can drive the XPR galvos independently, eliminating the need for additional FPGAs for this task.

84xx series

The 84xx series products offer the option to pair with the DLPA3082 and DLPA3085. The DLPA3082 has no LED drive section and requires an additional LED driver, whereas the DLPA3085 includes an LED drive section with a maximum drive current of 16A.

Resolution	Controller	DMD	DLPA3082	DLPA3085	XPR[2]	Suggested Brightness (lm)
1080p (1920*1080)	DLPC8424	DLP230NP	✓	✓	✓	600
	DLPC8445V	DLP472NP	✓	✓		1600
	DLPC8454	DLP473NE	✓	✓		4500
1440p (2560*1440)	DLPC8444	DLP3010	✓	✓	✓	1000
4K (3840*2160)	DLPC8445V	DLP391TP	✓	✓	✓	1000
	DLPC8445V	DLP390TP	✓	✓	✓	1600
	DLPC8445V	DLP472TP	✓	✓	✓	1600
	DLPC8455	DLP473TE	✓	✓	✓	4500
	DLPC8545[1]	DLP390TP	✓	✓	✓	1600
	DLPC8545[1]	DLP472TP	✓	✓	✓	1600
	DLPC8555[1]	DLP473TE	✓	✓	✓	4500

(1) Both the DLPC8545 and DLPC8555 implementations require two controllers to achieve a 4K 120Hz display, and additional FPGAs are needed to enable keystone correction. Other single-controller 4K implementations only achieve up to 4K 60Hz.
(2) The implementations marked as requiring XPR must be used with galvos to achieve the resolutions listed in the table. All 84xx series products can drive the XPR galvos independently, eliminating the need for additional FPGAs for this task.

Motor drive chips

In a projector system, several motor drive chips are needed, primarily used for the following applications.

1. XPR: As indicated in the DLP System Introduction above, some DLP implementations require the use of galvos to achieve the desired resolutions. A galvo is essentially an optical device within the optical engine. By vibrating, it divides one pixel into two or four sub-pixels, thereby improving the resolution. The DRV8847 is recommended.
2. Lens: On some high-end projectors, the lens is equipped with a motor that enables auto focus by extending or retracting the lens. The DRV8847 is recommended.
3. LSR: Due to the widespread use of laser light sources, the problem of speckle caused by laser interference can affect the consumer experience. Therefore, a vibrating optical device is usually installed in the optical path, which dithers to mitigate the speckle problem caused by interference. The MCF8315D is recommended.
4. PTZ: If the projector requires pan-tilt-zoom (PTZ) functionality, a motor and its corresponding motor drive chip are also required here. The DRV8847 is recommended.

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Conclusion

This article is intended to help engineers who are new to DLP projector systems quickly understand the matching and selection of DLP chips and gain an initial understanding of the overall projector system framework. More specific, detailed parameters can be found in the manuals of relevant products.

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