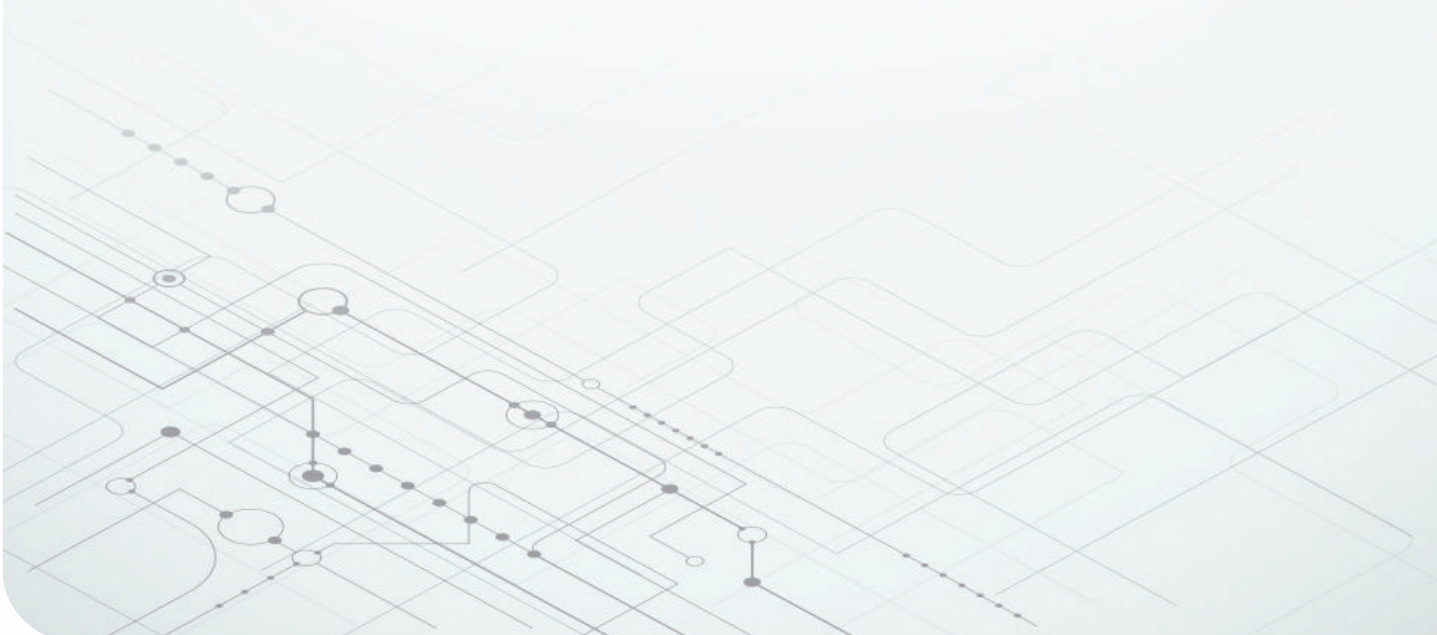


TI DLP® Products Illuminating the Way to Next-Generation 4K UHD Applications



Introduction

For video displays, bigger has always been better, or at least until higher degrees of resolution became just as important. Now, as 4K ultra-high-definition (UHD) content moves into the mainstream, the next wave of applications is emerging to display it. Of course, screen size and resolution still matter tremendously, but qualities like portability, low power, versatility and others which come with 4K UHD DLP® technology are just as essential for enabling next-generation applications like mobile smart TVs, smart projectors, laser TVs, digital signage, smart appliances and more.

4KUHD on the way

Much has been made of 4K UHD display technology and rightly so. The rich, vibrant detail that 8.3 million pixels on a screen can display is truly breathtaking.

Now that more and more 4K UHD content is becoming available and the cost of 4K UHD displays has come down, demand for 4K UHD equipment is increasing rapidly and so are the claims of technology providers. To reap the full benefits of 4K UHD, certain criteria must be met—8.3 million pixels must be displayed on the screen. Some supposed 4K UHD displays come up short, displaying as few as 4 million pixels. Each DLP technology 4K UHD solution exceeds **the Consumer Technology Association (CTA) definition** for 4K UHD technology.

Contrast is another critical parameter. Simply comparing a full white screen to a full black screen doesn't demonstrate the contrast the display is capable of, but a more accurate measurement of contrast can be made when both bright whites and dark blacks are both in an image on the screen.

This value can be found by looking for the American National Standards Institute (ANSI) contrast. Precise pixel alignment is also essential. Some 4K UHD projection systems have multiple imagers, one for each of the

three basic colors. Aligning 8.3 million pixels with three different imagers can sometimes be problematic; however, TI's 4K UHD DLP technology alleviates these concerns using a single display chip.

4K UHD DLP technology

At the heart of DLP technology is a digital micromirror device (DMD), which can contain more than 8 million highly reflective, switchable, tiny mirrors each about the size of a human hair. Each of these mirrors can represent one or more pixels. Combined with optics and controlled by sophisticated signal-processing algorithms which modulate each mirror independently, the DMD drives stunning 4K UHD video and still images.

The recent expansion of the DLP technology family of chipsets has brought the richness of 4K UHD displays not only to traditional projection systems for business, education and home theater, but also to a variety of new applications. These applications are taking advantage of the lower power and increased portability offered by products based upon DLP 4K UHD chipsets, without sacrificing the screen size, resolution, brightness, or contrast that consumers expect in a 4K UHD display.

Established applications

More traditional long-throw projector segments of home theater, business and education are beginning to migrate from 1080p high-definition systems to 4K UHD as the cost of this new equipment comes into line with older technology. Users that migrate to 4K UHD will be future-proofing their organization with the highest resolution projectors for years to come.

Business meetings, for example, could be more effective when everyone in the conference room can read the spreadsheet on the screen because it's being projected with the clarity and crispness of 4K UHD. Students may be drawn into the content the teacher is showing because it will be more compelling and immersive. Even

applications such as advertising or promotional signs will be transformed by 4K UHD projection technology.

Today's digital signs can be changed in real-time. With projected 4K UHD digital signage, extremely lifelike images and real-time information can be displayed together practically anywhere, on the windows or walls throughout a store.

In addition, these established projector applications can take advantage of the smaller form factors

that 4K UHD DLP chipsets enable. More compact projectors are easier to move to different classrooms or conference rooms. Home theaters can easily be taken down and set up, giving users the option of taking their home theater experience from room to room.

New applications—making it possible

Packing all of the capabilities of 4K UHD display technology into even smaller, lower-power chipsets can open the door for many of new and exciting applications which, until now, were extremely challenging to implement.

Mobile smart TV

By combining an application processor with a small, efficient DLP chipset, a mobile smart TV can provide a full-featured 4K UHD display along with a streaming video on demand (SVOD) endpoint.

This gives consumers a ready and easy way to add another SVOD display to a home or apartment.

Plus, adding high-quality stereo or surround sound speakers can create an easy-to-install home-theater-in-a-box. While light emitting diodes (LED) are a common illumination source, some new mobile smart TV products are using laser phosphor sources to increase the system brightness.

With short-throw optics, mobile smart TVs can be placed on a wide range of surfaces and cast a 4K UHD image on a wall or screen only inches away. As seen in **Figure 1**, for apartment dwellers, individuals who like displays

in their bedrooms or students in dormitories who don't really have the room for bulky flat panel screens, a mobile smart TV can be kept

in a drawer or some other out-of-the-way place until needed. And for consumers who move often, a mobile smart TV is much easier than flat panel displays to pack and transport.



Figure 1. Mobile Smart TVs can be utilized in a variety of settings.

Laser TV

Like mobile smart TVs, DLP technology-based laser TV scan deliver on-demand streaming content, but rather than LEDs, they use lasers as the illumination source. This allows the product to achieve higher levels of brightness, over 8,000 lumens. Laser illumination enables large, bright displays even in a well-lit room. Laser TVs can also feature ultra-short throw optics, which means they can be placed

just inches away from the wall, taking up very little space in the room. In addition, some laser TVs are bundled with an ambient light rejection screen which enhances the projected image and creates a glowing effect as seen in **Figure 2**.



Figure 2. Laser TVs with ambient light rejection screens.

Digital signage

Many signage solutions are not updated very often, even while the relevant information changes rapidly. Digital signage offers a method to display information as it changes in real-time. The digital signs in retail stores, for example, can communicate a change in a price for a special limited-time sale item. Or, they might respond to queries from shoppers. Still, flat panel digital signage is limited to just two dimensions—height and width. With DLP technology, projection displayed digital signs can compel engagement from the viewer, as seen in **Figure 3**, with moving imagery or non-traditional display surfaces. The front window of a store in a shopping mall might become one massive video display without obscuring the view into the store in the background. Digital 4K UHD projection signage can range from real-time informative to the totally immersive, drawing viewers into the scene on display.

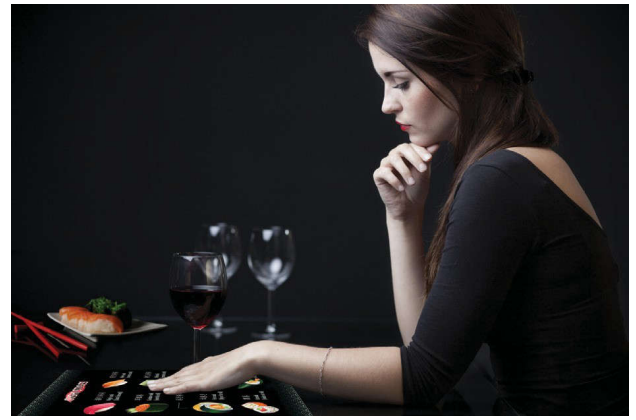


Figure 3. Interactive displays engage restaurant visitors.

Smart kitchen

Kitchen appliances like microwave ovens, refrigerators and stovetops have continued to incorporate new technologies. And now with the help of 4K UHD DLP technology, the entire kitchen can get a whole lot smarter. A 4K UHD projector could cast the outline of the stove top along with its control knobs onto the counter where the heating elements are embedded or map additional content on to custom range elements. Sensors could detect the cook's gestures and adjust the controls. And, if a recipe is needed, it could be projected onto the counter next to the stove top as seen in **Figure 4**.

The cook might even decide to stream a video while waiting for the pot to boil. The possibilities are endless. DLP technology gives designers more unique ways to differentiate their products.

TI's 4K UHD DLP chipsets



Figure 4. New ways to showcase a cooking video.

Recent additions to TI’s family of 4K UHD DLP chipsets have made it the most comprehensive set of 4K UHD solutions in the industry shown below in Figure 5. Each chipset has been optimized to meet the requirements of a particular segment of applications. The chipsets range from one optimized on size and power savings for portable applications; another is also small enough for portable systems but it provides even higher levels of brightness; and a third chipset generates the brightness needed in some of the most demanding projection applications.

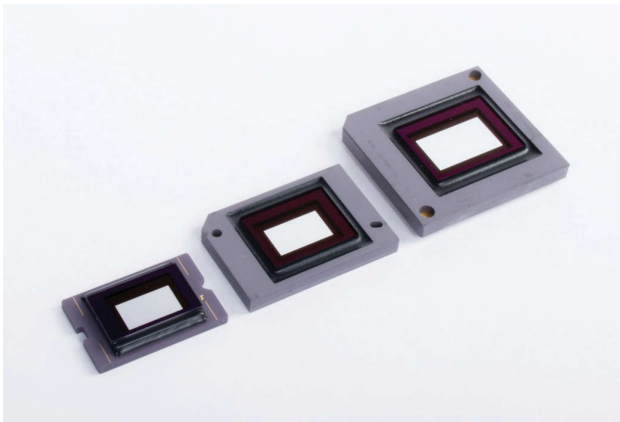


Figure 5. DLP472TP, DLP472TE, DLP560TE

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DMD	Controller	System brightness (max) (lm)	Array diagonal (in)	Input frame rate (max) (Hz)	Illumination
DLP472TP	DLPC8445	2,000	0.47	60	LED
DLP472TE	DLPC7540	6,000	0.47	60	Laser-phosphor, LED, RGB laser, Lamp
DLP780TE	DLPC4420	7,000	0.78	60	Laser-phosphor, RGB laser, LED
DLP650TE	DLPC7540	8,000	0.65	60	Laser-phosphor, RGB laser, LED, Lamp
DLP781TE	DLPC4420	13,000	0.78	60	Laser-phosphor, RGB laser

Table 1. Family of DLP 4K UHD chipsets.

As the demand for 4K UHD displays continues to grow, the DLP 4K UHD chipset family is growing along with it. Developers have a range of options to suit their needs, for more information, visit [TI.com/4K](https://www.ti.com/4K).

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