

# TI DLP® Products:

## Enabling Innovation in Projection Display

Susan Ji  
July 11, 2018

# Agenda

Market  
Opportunity

Display  
product  
portfolio

New  
Applications  
driving growth

Getting started

# Projection Display Growth Potential(new)



- ❑ **>\$127B total display market<sup>1</sup>**
- ❑ **>\$9B total projection market<sup>2</sup>**
- ❑ **Laser TV's expected to grow 40% CAGR<sup>3</sup>**
- ❑ **Mobile Smart TV's expected to grow 28% CAGR<sup>3</sup>**
- ❑ **Continuously growing applications**

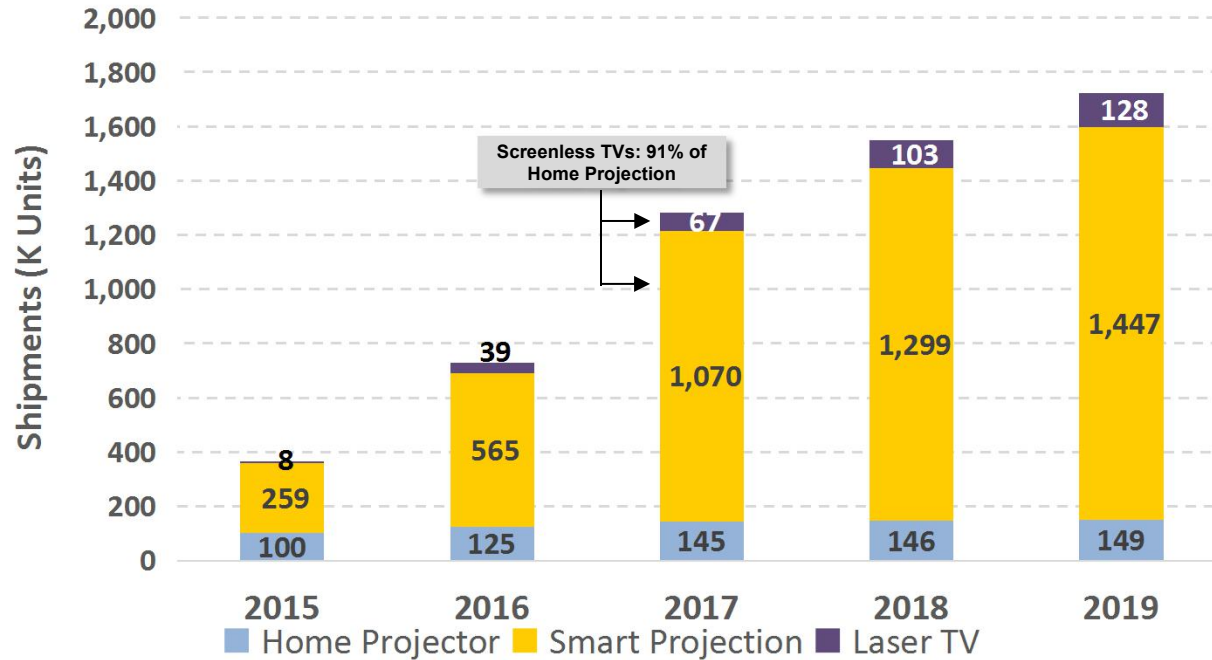
1. Based on IHS Market Technology Display Long-Term Demand Forecast Tracker, October 2016. Not an endorsement of Texas Instruments.

2. PMA Research

3. Futuresource Global Screenless TV Market Report (May 2017) – CAGR based on forecast from 2016 to 2021

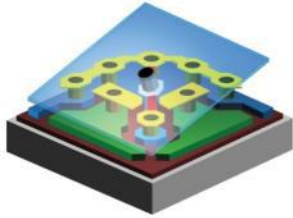
# Screenless TV application growth(new)

China Home Projection & Screenless TV Forecast



Source: Futuresource – Global Screenless TV Market Report (May 2017). For more information visit [www.futuresource-consulting.com](http://www.futuresource-consulting.com)

# DLP Technology display market growth factors



TRP Pixel



DLP IntelliBright™ technology

## □ Performance

- Efficiency (Lumens/Watt; Lumens/cc) – advancements
  - (1) imaging technology-TRP pixel
  - (2) illumination
  - (3) optical technology/design

# DLP Technology display market growth factors



Smartphones



Tablets

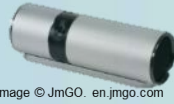


Image © JmGO. en.jmgo.com

Mobile Smart TV



Mobile Professional



Laser TV



Wearable Displays



Projection Mapping



Smart Speaker



Aftermarket HUD



Digital Signage



Smart Home



Stage Lighting

## ❑ Performance Advancements

- ❑ Efficiency (Lumens/Watt; Lumens/cc) – advancements
  - (1) imaging technology-TRP pixel
  - (2) illumination
  - (3) optical technology/design

## ❑ Expansion into new product categories

- ❑ Mini/mobile projector solid growth
- ❑ New emerging applications driving growth
  - ❑ Mobile Smart TV (Screenless TV)
  - ❑ Laser TV
  - ❑ Smart Speaker
  - ❑ Smart Home
  - ❑ Wearable display
  - ❑ Digital Signage
  - ❑ Digital Lighting

# DLP Technology display market growth factors

- ❑ Performance Advancements
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    - (2) illumination
    - (3) optical technology/design
  
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    - ❑ Laser TV
    - ❑ Virtual Assistant Display
    - ❑ Smart Home
    - ❑ Wearable display
    - ❑ Digital Signage
    - ❑ Digital Lighting
  
- ❑ Technology Accessibility
  - ❑ Easier to access and develop with DLP Pico (TI.com)
  - ❑ Access to an extensive and mature ecosystem

# Fast time to market: ti.com/dlp

## Evaluation

□ DLP LightCrafter™ Display EVMs

**WVGA to 1080p**  
>HDMI plug and play  
>PC software GUI  
[TI.com/PicoEVM](http://TI.com/PicoEVM)

**\$99**  
DLP2000  
0.2 nHD  
[TI.com/DLP99](http://TI.com/DLP99)

- Configuration using I<sup>2</sup>C
  - LED brightness control
  - Image manipulation
  - DLP IntelliBright™ algorithms
  - More...

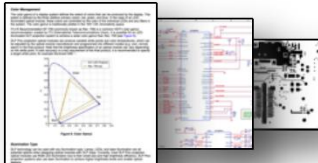


□ E2E community

## Development

### Electronics

□ TI designs & tech docs



□ System integrators



### Optics

□ MP<sup>1</sup> optical modules



[TI.com/PicoOpticalModules](http://TI.com/PicoOpticalModules)

□ Custom design



<sup>1</sup>MP : mass production

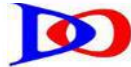


# Strong ecosystem

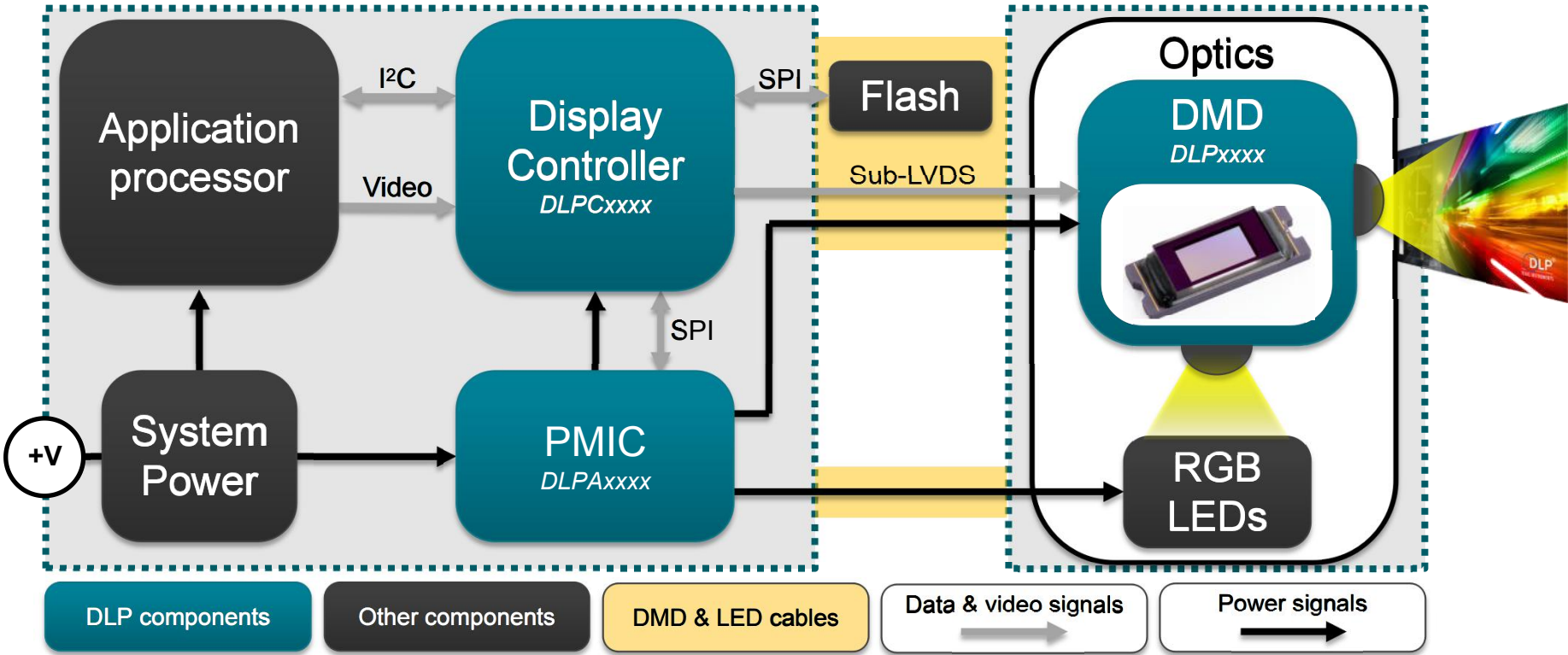
Large number of companies committed to DLP technology



- Evaluation modules
- Optical engines
- System Integration
- Optical design
- Hardware
- Software

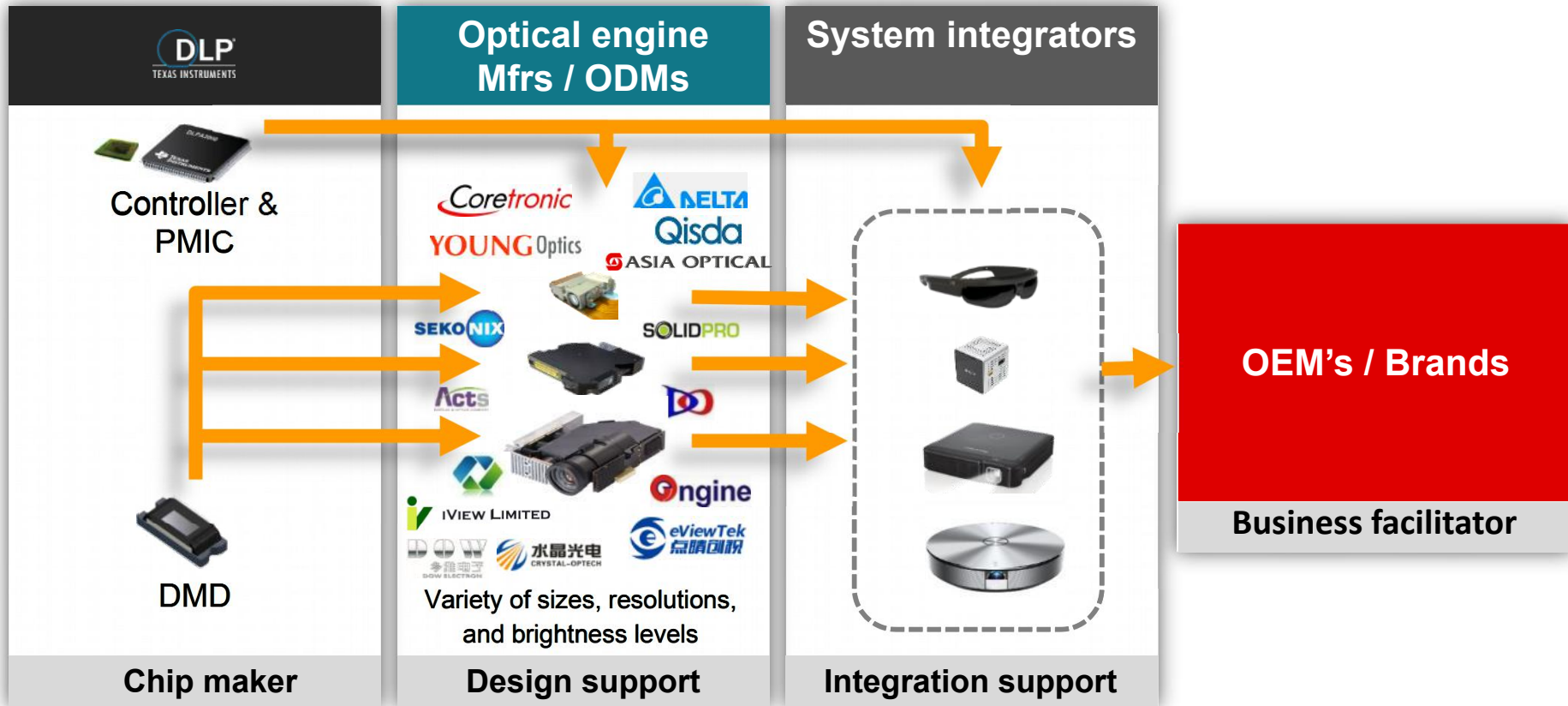


# DLP Technology display sub-system



TI Information – Selective Disclosure

# DLP Products business model and ecosystem



# Agenda

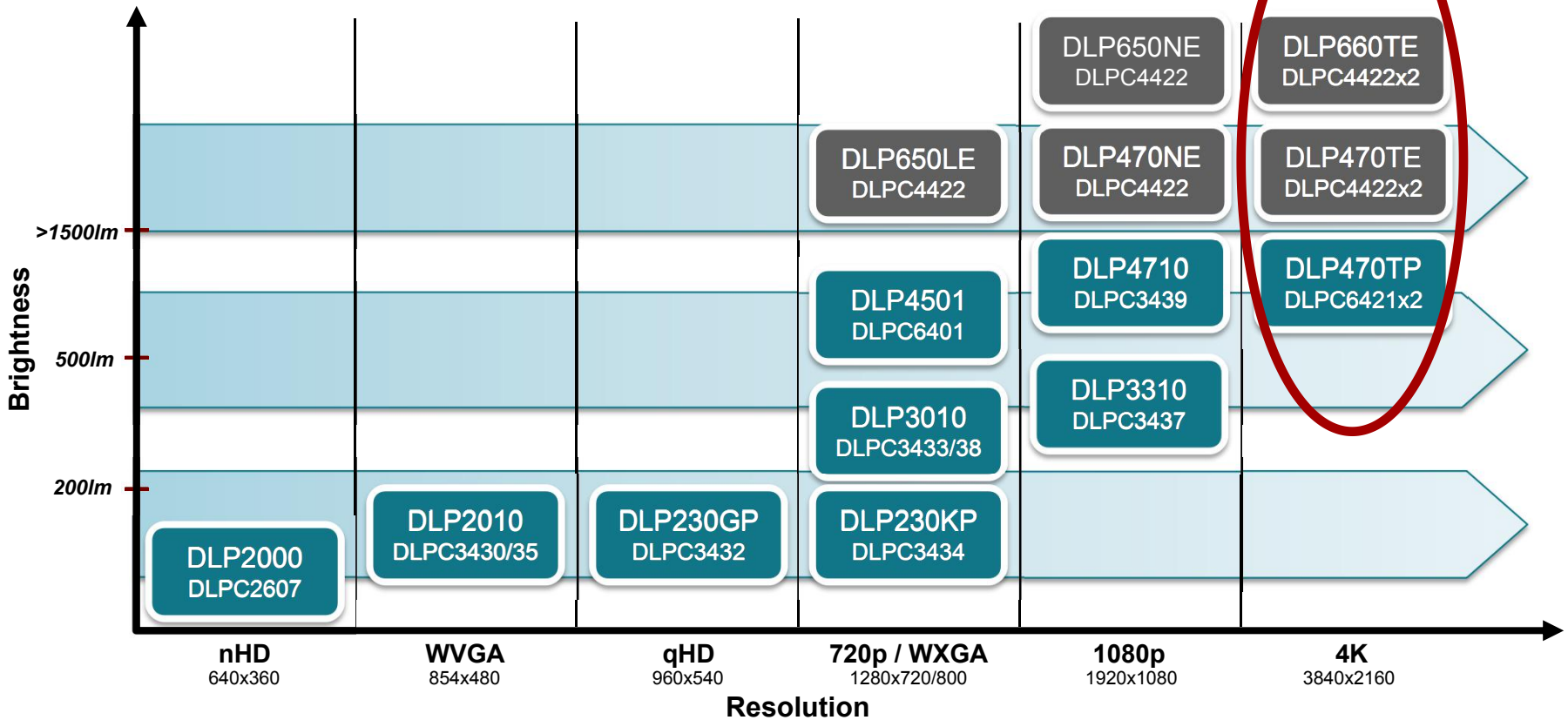
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# DLP Products portfolio



# DLP Products display product segments

Ultra Mobile, Ultra Low Power  
(<200L)

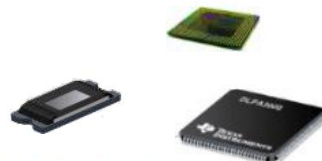
Mobile Low Power  
(<600L)

Compact High Resolution  
(<1500L)

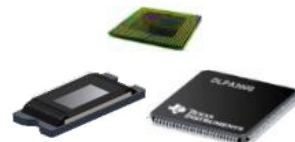
## .2" Series Products



DLP2000(.2"nHD)



DLP2010(.2" WVGA)



DLP230GP(.23"qHD)

## Applications

- Smartphone
- Tablet / laptop
- Mobile accessory
- Smart Speaker
- Wearables



# DLP Products display product segments

**Ultra Mobile, Ultra Low Power**  
(<200L)

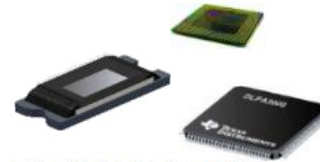
**Mobile Low Power**  
(<600L)

**Compact High Resolution**  
(<1500L)

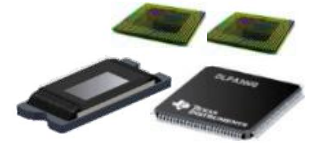
## .3" Series Products



.3" WVGA



DLP3010(.3 720P)



DLP3310(.33 1080P)

## Applications

- Mobile Smart TV (Screenless TV)
- Mobile standalone / accessory
- Aftermarket Head-Up Display (HUD)
- Wearables

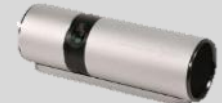


Image © JmGO. en.jmgo.com

# DLP Products display product segments

**Ultra Mobile, Ultra Low Power**  
(<200L)

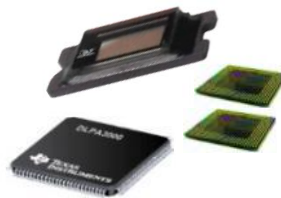
**Mobile Low Power**  
(<600L)

**Compact High Resolution**  
(<1500L)

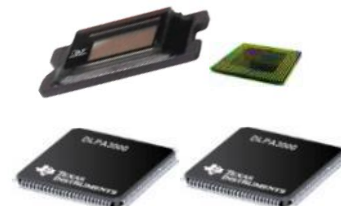
## .4" Series Products



DLP4501(.45" WXGA)



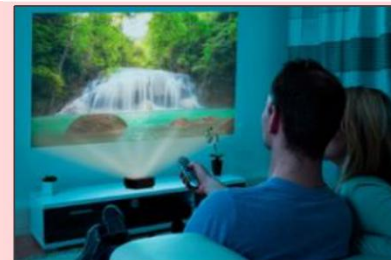
DLP4710(.47" 1080p)



DLP470TP(.47" 4K )

## Applications

- Mobile Enterprise/Education
- Laser TV
- Mobile Smart TV
- Signage
- Interactive/Immersive Computing





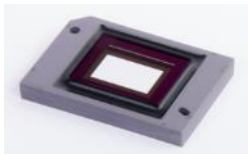
# DLP Products display product segments

**High Brightness,  
Compact**  
(<4000L)

**Balanced Execution**  
(<10000L)

**High Brightness**  
(<20000L)

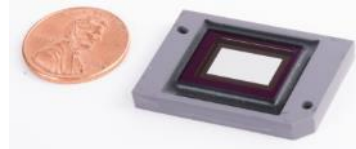
## .4" Series Products



.47" 1080p Chipset



.48" WUXGA Chipset



.47" 4K UHD Chipset

## Applications

- Entertainment/Enterprise
- Screenless TV
- Smart Laser Projectors
- Gaming
- Digital Signage



# DLP Products display product segments

**High Brightness,  
Compact**  
(<4000L)

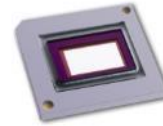
**Balanced Execution**  
(<10000L)

**High Brightness**  
(<20000L)

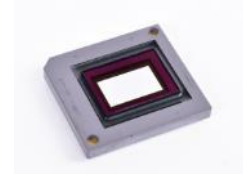
## .6" Series Products



.65" WXGA Chipset



.65" 1080p Chipset



.66" 4K UHD Chipset

## Applications

- Enterprise/Education
- Screenless TV
- Smart LED Projectors
- Gaming
- Digital Signage



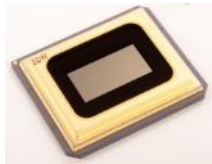
# DLP Products display product segments

**High Brightness,  
Compact**  
(<4000L)

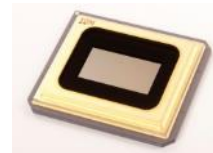
**Balanced Execution**  
(<10000L)

**High Brightness**  
(<20000L)

## .9" Series Products



.9" SXGA+ Chipset



.95" 1080p Chipset

## Applications

- Stage Lighting
- Architectural Lighting
- Video Wall
- Large Venue
- Digital Signage



# What is mobile smart TV?

- Smart TV



- Smart with built in streaming media applications and/or operating system
- LAN/Wi-Fi Internet access to stream your content

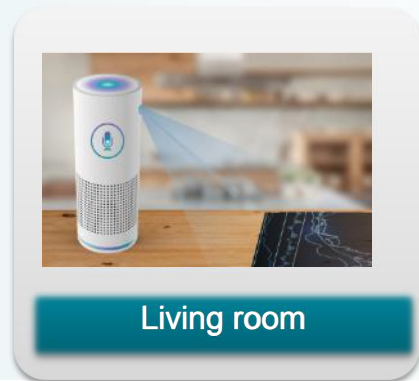
- Mobile smart TV



Screenless	Scalable	Small	Quick setup	Content
			<ul style="list-style-type: none"><li>▫ 2 Lb</li><li>▫ Charge Go!</li></ul>	LAN & Wi-Fi Access your content at home
			<ul style="list-style-type: none"><li>▫ &gt;25 Lb</li><li>▫ Mount</li><li>▫ Cables</li></ul>	LAN, Wi-Fi, LTE Access your content anywhere you go

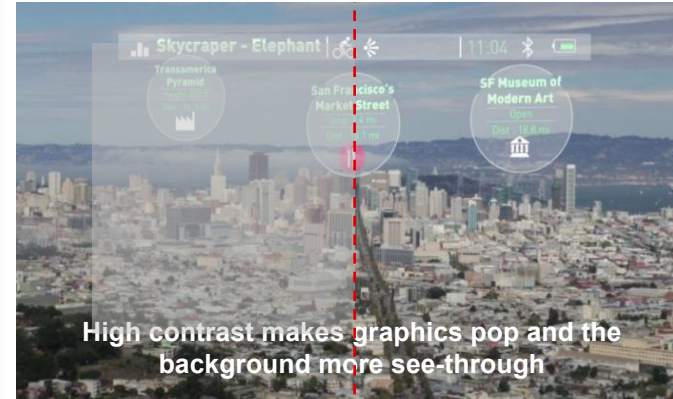
# Smart Speaker displays with DLP technology

Features	Benefits
Free-form Images	Displays of any shape on virtually any surface
On-demand display	On when you want it, invisible when you don't
Compelling Form Factors	High-resolution images from compact optical modules.



# Augmented Reality (AR) with DLP technology

Features	Benefits
<b>High optical efficiency</b>	Good fit for wearable displays that demand high brightness over a medium to large field of view.
<b>Fast Pixel Switching</b>	Support frame rates up to 240 Hz, depending on the input resolution, and enable low latency display systems. High switching speed reduces motion blur.
<b>High Contrast</b>	High contrast ratios enable a highly transparent display background even at high brightness levels.
<b>DLP IntelliBright™</b>	Save power with Content Adaptive Illumination Control(CAIC). Increase display vividness with Local Area Brightness Boost(LABB)
<b>High Fill factor</b>	Stream media and content directly over Wi-Fi
<b>Small Size</b>	Enables very compact optical engine designs that meet the space-constrained demands of wearable displays.



# Laser TV with DLP technology

Features	Benefits
<b>Laser phosphor light source</b>	High brightness, long lasting
<b>Portable</b>	Can be moved from room to room or share media with family and friends outdoors
<b>Easy installation</b>	With ultra short optics, the display unit can be placed inches away from a wall or screen and display a 80+in image
<b>Flexible display size</b>	Users can customize their screen size based on their use case
<b>Smart</b>	Stream media and content directly over Wi-Fi
<b>Aesthetics</b>	Can be easily removed when not in use or embedded into furniture and not visible when turned off

## End equipment example



Image © Hisense



Image © JmGo

# Laser TV with DLP technology



Ultra-short Throw Projection

**Compact Equipment** - designed to seamlessly fit equipment into any setting with powerful display capabilities.

## Laser phosphor technology

- Bright and large displays
- Longer lifetime
- Instant on and off capability



Bright Portable System



High Speed Content

Fast refresh rates and high frame rates **lowers display latency and reduces motion blur.**



# Digital Signage with DLP technology

Features	Benefits
<b>High thermal capacity</b>	Large, high brightness displays for vivid and attention-grabbing digital signage Enables projector systems that display up to 10,000 lumens
<b>Display on any surface</b>	Enables projected displays that create an image on virtually any surface, allowing the surface to transform into a display while maintaining its original purpose
<b>Light source agnostic</b>	Compatible with virtually any light source, including lamp, lasers, and LEDs Enables projector systems with lifespans up to 20,000 hours
<b>Free form</b>	Displays can be developed with custom shapes and curvatures to create unique, attention grabbing designs

## Taking digital signage to another level

- Use ordinary surfaces and objects to convey information
- Transform a product display into an immersive experience and informational tool.



# High-brightness LED projector with DLP technology

Features	Benefits
<b>LED Light Source</b>	Beautiful color performance with a 15% red/white ratio
<b>.65 1080p DMD</b>	Displays high definition 1080p resolution
<b>High-brightness</b>	Capable of 3,000 lumens with 4 P3 LED's using "top-side pump" technique
<b>Competitive contrast</b>	700:1 ANSI contrast for a captivating viewing experience
<b>Telecentric optics</b>	Enables a compact optical architecture using f/1.6



Screenless TV



Smart LED Projectors



Digital Signage

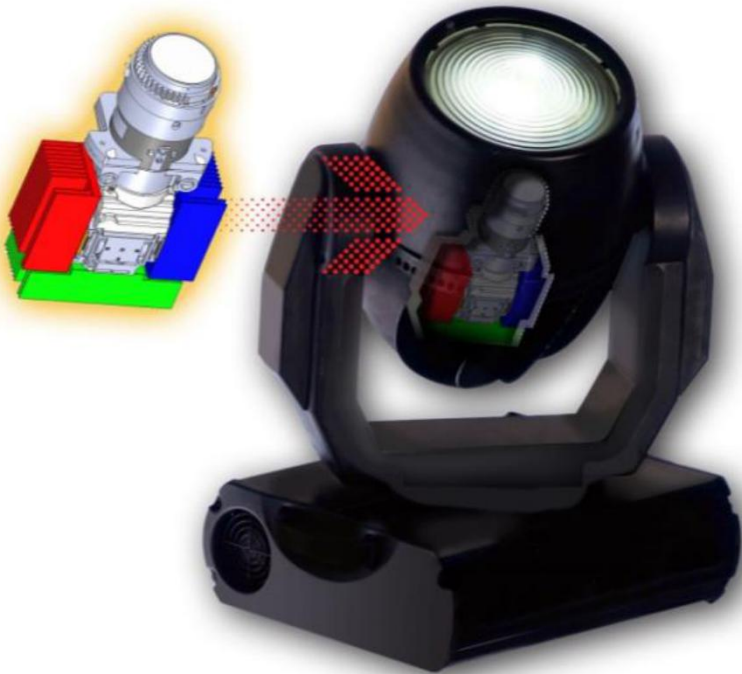
# Stage Lighting with legacy technology

## System Features

- Bright (Typically 15k-30k lumens)
- Color control (single color/pattern)
- Limited pattern variety
- Motors and mechanical components for GOBO control



# Stage Lighting with DLP Technology



Ultimate Pattern Control – Display an infinite number of patterns which can be reprogrammed from anywhere at anytime

No Motors – DMD-based systems do not rely on motors to change images

High Brightness – Systems using DMDs are capable of achieving 15k+ lumens with a single DMD

# Agenda

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# Extensive resources at [TI.com.cn/dlp](http://TI.com.cn/dlp)

## Getting started



### Getting to know DLP Pico technology

Learn the basics of the technology.



### Beginning development

Start development with evaluation tools, optical modules and technical resources.



### Advanced Development

Leverage support resources for advanced and custom designs.

## 3rd Party Evaluation Modules

### Keynote Photonics FlexLight 4K-HLD EVM



## 32 devices available

Complete	Part Number	SubFamily	Component Type
<input type="checkbox"/>	DLPA1000 - Power Management and LED Driver IC for DLP2000 Projectors	Pico Chipsets	PMIC/LED Driver
<input type="checkbox"/>	DLPC2607 - Low-power DLP® Display Controller	Pico Chipsets	Controller
<input type="checkbox"/>	DLPC6401 - DLP® Display Controller for High-brightness Portable Displays	Pico Chipsets	Controller
<input type="checkbox"/>	DLP480RE - DLP® 0.48 WUXGA DMD	Standard Chipsets	DMD
<input type="checkbox"/>	DLP660TE - DLP® 0.66 4K UHD DMD	Standard Chipsets	DMD

## Buy off-the-shelf optical engines



Supplier: Anhua (China)

Brightness: <300 lm  
Size: 81.5 x 57.0 x 14.7 (mm) without lens  
Throw Ratio: 1.2  
Offset: 100%

[Detail specs >](#)

[Buy from Supplier](#)



Supplier: iView (China)

Brightness: <300 lm  
Size: 59.0 x 66.0 x 13.2 (mm)  
Throw Ratio: 1.47  
Offset: 100%

[Detail specs >](#)

[Buy from Supplier](#)



Supplier: Ongine (China)

Brightness: <300 lm  
Size: 44 x 55 x 16.2 (mm)  
Throw Ratio: 1.66  
Offset: 100%

[Detail specs >](#)

[Buy from Supplier](#)

## 6 DLP Display EVMs

Evaluation module	Resolution	DMD	Regular price	TI store discount	Discount code	Order
DLPOLN4710EVM-G2	1080p	DLP4710	\$809	\$100 off	100off1080p	Order now
DLPOLR3310EVM	1080p	DLP3310	\$849	\$100 off	100off1080p	Order now
DLPOLR0010EVM-G2	720p	DLP3010	\$699			Order now
DLPOLR0010EVM	720p	DLP3010	\$699			Order now
DLPOLCR010EVM	WVGA	DLP2010	\$399	New low price		Order now
DLPOLCR000EVM	HD	DLP2000	\$99	Lowest priced EVM		Order now



DLP LightCrafter™ Display 4710-G2 evaluation module



DLP LightCrafter Display 3310 evaluation module



DLP LightCrafter Display 3010 evaluation module

More...

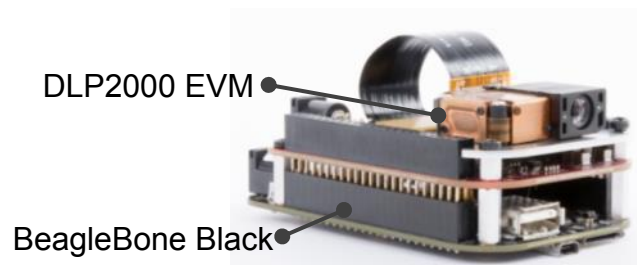
- TI Designs
- E2E community
- DLP design network
- White papers
- Application notes

# Industry's most affordable pico projection EVM

Designers need **affordable, low power, and free-form** display solutions.

**\$99**

The DLP2000 chipset and EVM **opens the door** for developers to incorporate high-performing DLP display technology with virtually any **low-cost processor**, such as the BeagleBone Black.



# High brightness display products launch on TI.com.cn/dlp!

**Laser TV White Paper**

TI DLP® technology for laser TV displays

**Digital Signage White Paper**

Using TI DLP® technology to make digital signage more effective

**Laser TV Blog**

Laser Focus on the Future of TV

Visualize new possibilities for digital signage

Pushing the boundaries of 4K UHD

**Digital Signage Blog**

Visualize new possibilities for digital signage

Pushing the boundaries of 4K UHD

**4K UHD Blog**

Pushing the boundaries of 4K UHD

**.66 4K UHD TI Design**

4K UHD High Brightness Display Reference Design using TI DLP® Technology

Key Document

Description

Features

**0.66 4K UHD**

DLP660TE (ACTIVE)  
DLP® 0.66 4K UHD DMD

DLP660TE 0.66 4K UHD DMD datasheet

TI DLP® technology for Laser TV displays

TI DLP® technology for digital signage

**0.65 1080p**

DLP650NE (PREVIEW)  
DLP® 0.65 1080p DMD

DLP650NE 0.65 1080p 5600 DMD datasheet

**0.48 WUXGA**

DLP480RE (PREVIEW)  
DLP® 0.48 WUXGA DMD

DLP480RE 0.48 WUXGA DMD datasheet

**0.47 1080p**

DLP470NE (PREVIEW)  
DLP® 0.47 1080p DMD

DLP470NE 0.47 1080p DMD datasheet



# Summary



**The DLP display market** *is poised for growth powered by*

- Technology advancements
- Broad portfolio of display products
- Growing DLP Display application space



**DLP differentiation**

- Superb image quality
- Tiny form factors, large free-form displays
- High illumination efficiency



**Easy to get started**

- All the tools you need at TI.com
- Strong mature ecosystem

**Thank You**

**谢谢**