



**德州仪器DLP®技术赋能智能及动态化的车身
照明**

**TI DLP® Technology is enabling smart &
dynamic lighting all around the vehicle**

DVN Shanghai

April 19-20

袁国航 / Terry Yuan

主题 / Agenda

- DLP汽车概述, 投资策略及应用端支持 / DLP Automotive overview, investment strategy and device application support
- 动态照地灯(DGP)趋势与开发板介绍 / Dynamic ground projection (DGP) trends and EVM introduction
- DLP汽车高分辨率前照灯的优点及未来应用的支持 / DLP Automotive high resolution headlight advantages and future application support

DLP汽车 - 终端应用 / Exterior end equipment

High resolution headlight



- ❑ Highest resolution ADB available
- ❑ 14°x7° FOV for ADB & symbols
- ❑ Object detection support
- ❑ Nighttime ADAS enhancement

Symbol projection



- ❑ Lane markings & communication
- ❑ CAN support & easy integration
- ❑ Highly customizable
- ❑ Dedicated symbol projection unit

Dynamic ground projection



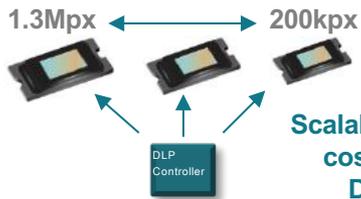
- ❑ Customization & safety features
- ❑ Single and full-color support
- ❑ GPU Free video & image generation
- ❑ Compact stand alone modules

DLP汽车 – 投资策略 / Investment Strategy

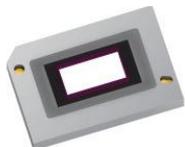
Solution cost



Innovations in silicon and packaging technologies to deliver high performance, automotive qualified chipsets.



Scalability – Single low cost controller for DMD portfolio



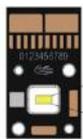
4 x smaller package



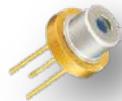
Efficiency



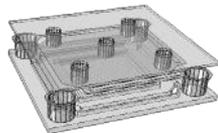
Innovations in optics, illumination and pixel technology to enable high brightness at minimal power.



Adaptive LED
1.3x ↑ efficiency



Laser illumination
1.7x ↑ NTSC Color gamut



Phase light modulation (in development)
5x – 10x ↑ efficiency for symbol projection

Reduced size



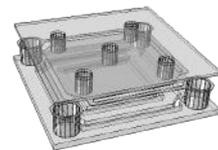
Enabling compact solution new optical architectures, pixel design and optics concepts.



Waveguides, Holographic Optical Elements
> 3x AR HUD system volume reduction

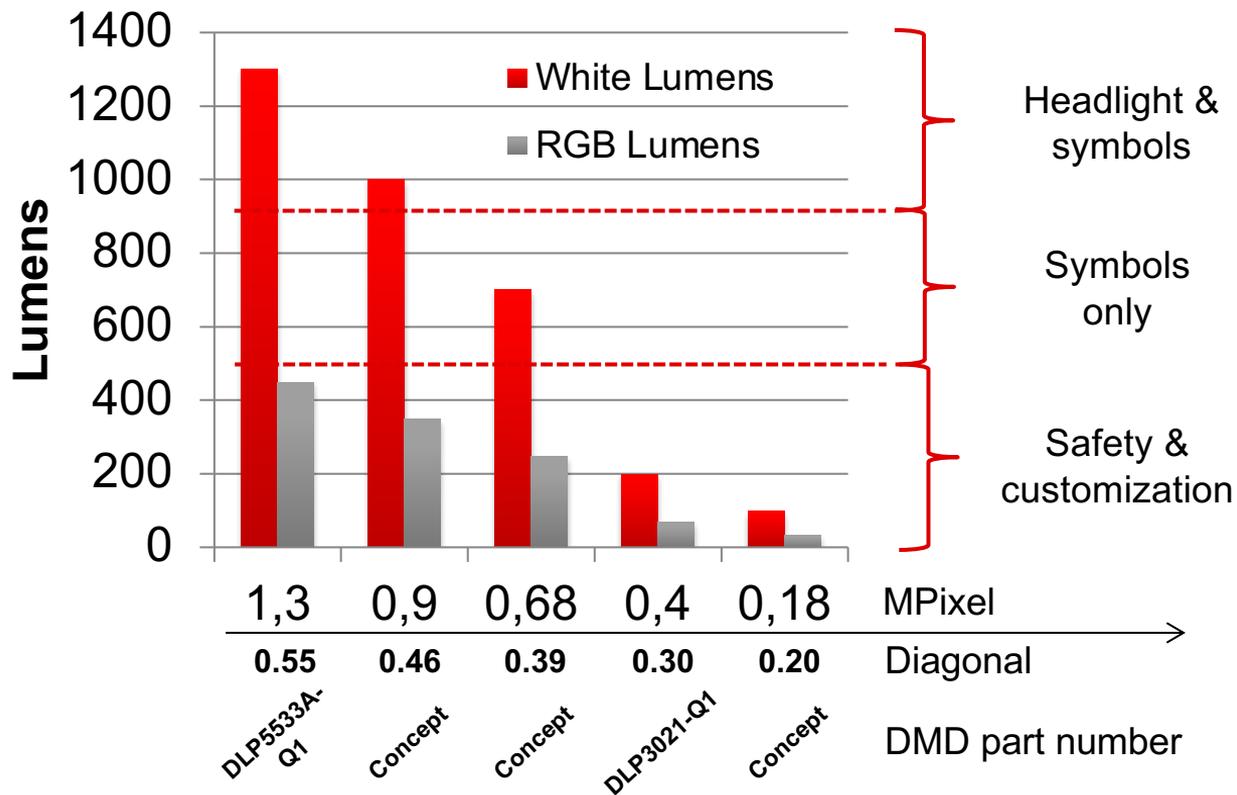


Smaller DMDs and projectors



Computer generated holography (PLM)

DLP汽车 – 应用端支持 / Device application support



DLP汽车 – 外部照明市场趋势 / Exterior lighting market trends

- Static projectors are becoming common in vehicles for customization, but offer limited uses.
- DLP technology can add dynamic projection around the car for a variety of uses:

Vehicle to Pedestrian (V2P) communication



Orchestration & personalization

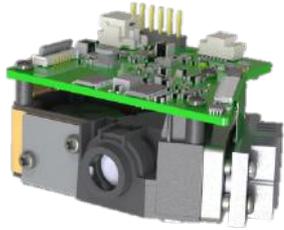


- DLP Auto enables dynamic projection around the car to enable communication such as vehicle warning messages and customizable welcome sequences or messaging.
- DLP Products are automotive qualified, highly efficient, enable simplified electronics architecture for easy vehicle integrations, support RGB images and video.

DLP3021LEQ1 开发板介绍 / EVM introduction

System features with DLP Products

- Full color video and images using RGB LEDs
- No video interface required, easy integration in vehicle
- Flexible design for all brightness, color requirements
- WVGA resolution (864x480)



Approximate Optical Module Size
65mm x 43mm x 25mm

EVM Specifications

Brightness	Up to 35 lm @ 3.5W power
Contrast	~750:1
Image Size	310-420mm diagonal @ 850-1150mm throw dist.



Example applications



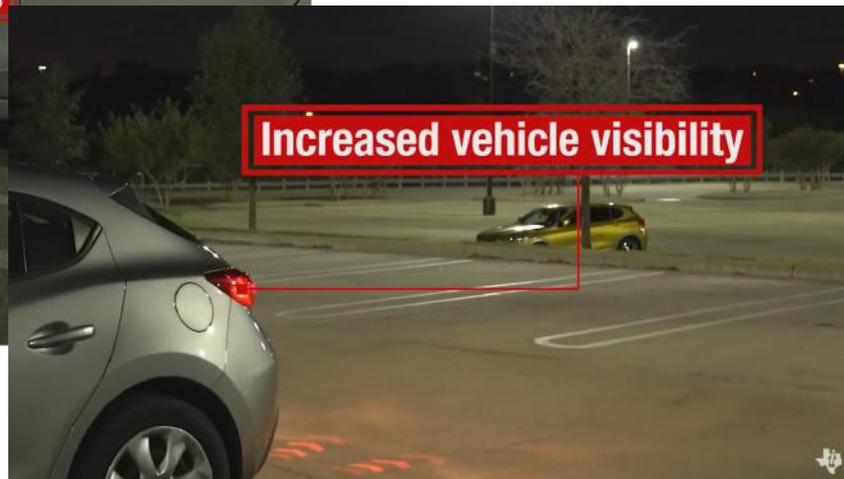
Approximate video length

Flash size	RGB video length*	Single color video length*
512 Mb	6-12 s	15-30 s
1 Gb	12-24 s	30-60 s
2 Gb	24-48 s	60 – 120 s

*Depends on DMD, resolution, frame rate, compressibility

动态照地灯DGP演示视频 / Demo video for DGP

<https://training.ti.com/dynamic-ground-projection-dlp-auto-technology>



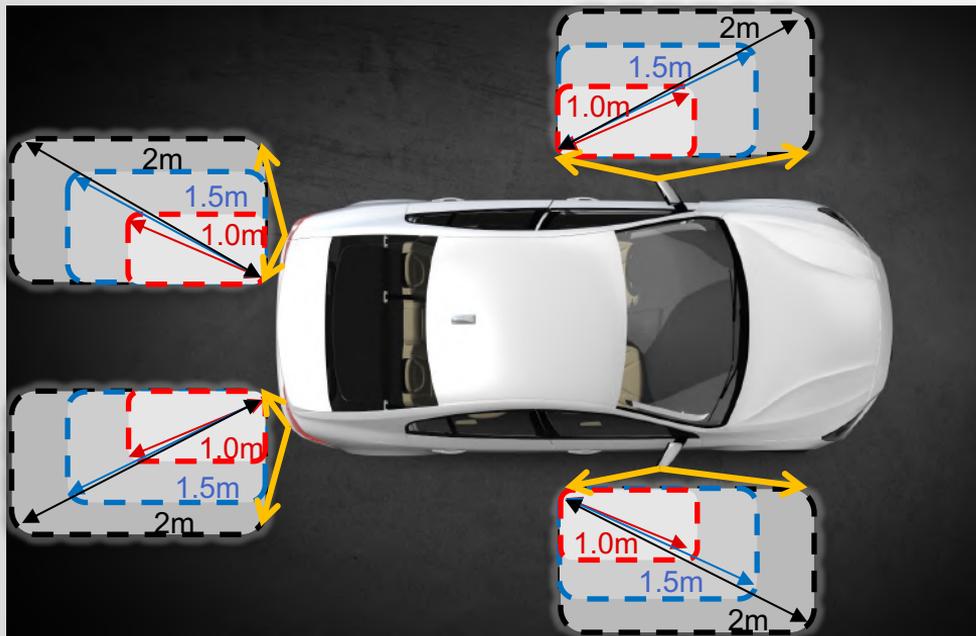
Key Use Cases

Animated logos

Safety features

Vehicle visibility

车身DGP的灵活布置 / Scalable DGP all around the vehicle



DMD (16:9 AR)	Lumens White	Lumens RGB	Diagonal Size
0.20" (Concept)	200	30	1.0 m
DLP3021-Q1	400	66	1.5 m
0.39" (Concept)	700	116	2.0 m

DGP roadmap: multiple DMDs to support various image sizes with **constant brightness**

Assumptions:

- RGB lumens predicted lower than white lumens due to lower efficiency and faster f/#
- 75 lux target

DLP汽车高分辨率前照灯的优点

Advantages of DLP Auto High resolution headlight

Highest resolution ADB



Benefits:

- With the highest resolution available, DLP Technology enables ADB systems to maximize light on the road without glaring other drivers.

Detect objects & hazards



Benefits:

- DLP Automotive headlights can improve the vehicle's ADAS system by projecting patterns, which are invisible to the driver, to help the front camera detect objects in the road.

Enables symbol projection



Benefits:

- Help the driver through hazardous driving conditions and construction with lane marking.
- Increase confidence for everyone on the road by communicating intent.

DLP 汽车的价值主张的演变- 新功能的出现 as new lighting functions emerge



High resolution ADB



V2X communication



Symbol
Projection

Communication

2020



360° dynamic
projection



Animated welcome light

Vehicle orchestration

2021



Structured light detecting
potholes or objects in the road



Weather detection



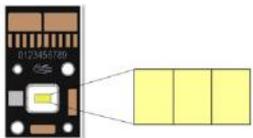
Object/pedestrian
detection

Camera support

2022+

总结 / Summary

Investment strategy

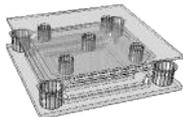


System efficiency



Smaller packages

New technologies



- Cost reductions
- Improved efficiency
- System volume reductions
- Easy to integrate systems

Dynamic ground projection



- Customization & communication
- “GPU-free” video generation
- DMDs to support many image sizes
- DLP3021LEQ1EVM available now

High resolution headlight



- Highest resolution ADB
- Complex symbol projection support
- Object detection support
- Future application support

谢谢大家
Thank you