汽车显示面板市场竞争格局变化

Stacy Wu 吴宥缃
中小型显示器
IHS Markit I 技术、传媒、电信
Stacy.Wu@ihsmarikt.com
其他信息: automotive@ihsmarikt.com

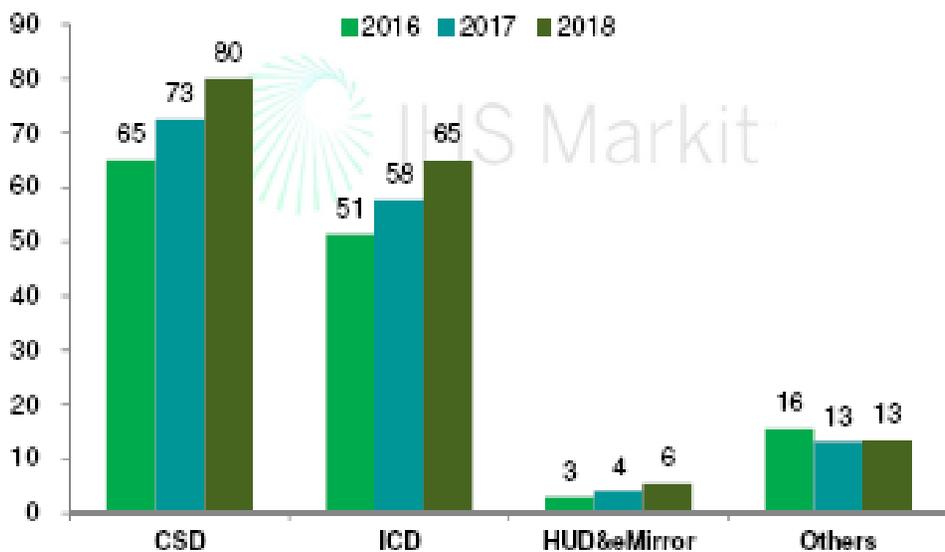会议日程

- 市场重新洗牌：中国企业不断崛起
- 供应链正在进化：**CDC**改变行业格局
- **2018**年国际显示周展示的相关技术：下一代汽车显示器将会是什么
- 结语

汽车显示器市场预计将稳定和可持续发展

汽车显示面板总出货量——按应用区分

2016年、2017年和2018年三年对比（百万台）

	2016	2017	2018
Total	**135.1**	**147.7**	**164.0**

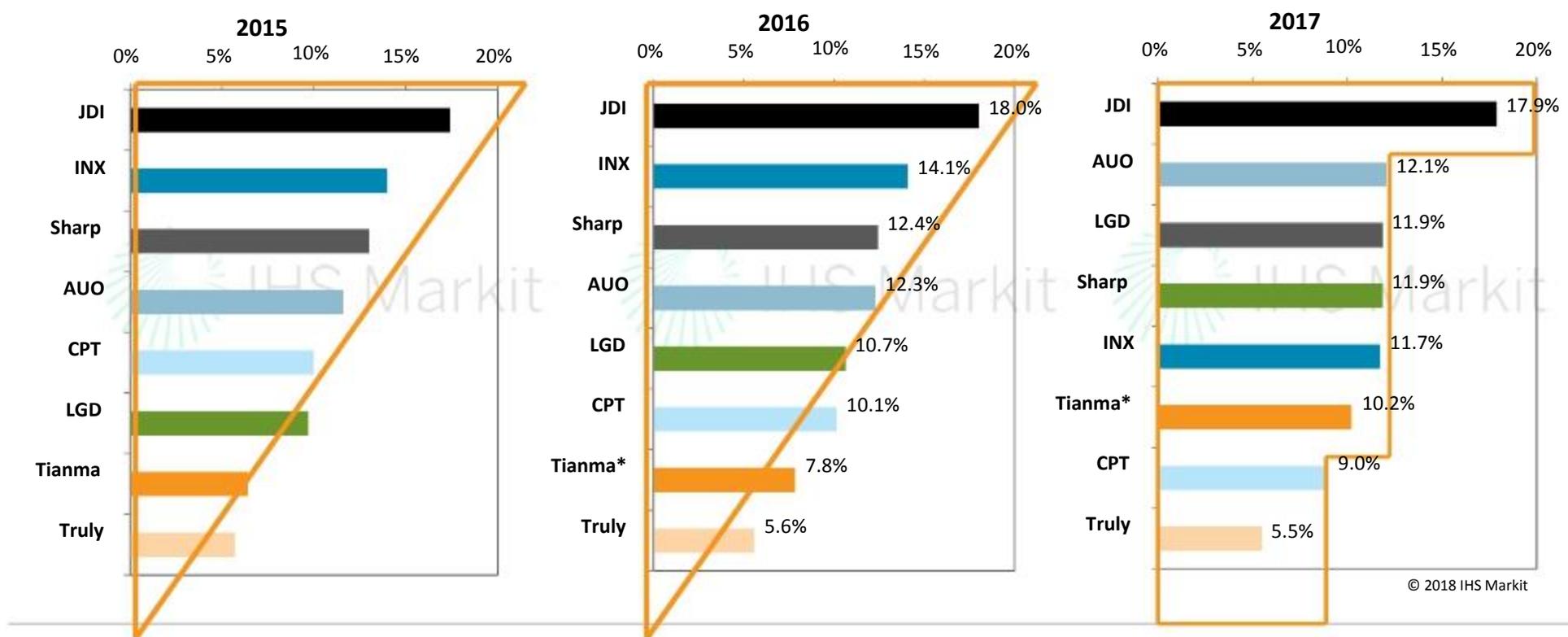|	YoY '15-'16	YoY '16-'17	YoY '17-'18
Total	13.6%	9.3%	11.1%
CSD	N/A	11.4%	10.2%
ICD	29.4%	12.0%	12.9%
HUD/eMirror	81.9%	41.4%	30.9%
Others*	N/A	-14.9%	1.4%

注：应用定义请详见附件

来源：IHS Markit Automotive Display Market Tracker

JDI占据市场领先地位，其他市场参与者的份额越来越接近

汽车显示面板总出货量份额
2015年、2016年和2017年三年对比（%份额）

2015

| 0% | 5% | 10% | 15% | 20% |

- JDI
- INX
- Sharp
- AUO
- CPT
- LGD
- Tianma
- Truly

2016

| 0% | 5% | 10% | 15% | 20% |

- JDI — 18.0%
- INX — 14.1%
- Sharp — 12.4%
- AUO — 12.3%
- LGD — 10.7%
- CPT — 10.1%
- Tianma* — 7.8%
- Truly — 5.6%

2017

| 0% | 5% | 10% | 15% | 20% |

- JDI — 17.9%
- AUO — 12.1%
- LGD — 11.9%
- Sharp — 11.9%
- INX — 11.7%
- Tianma* — 10.2%
- CPT — 9.0%
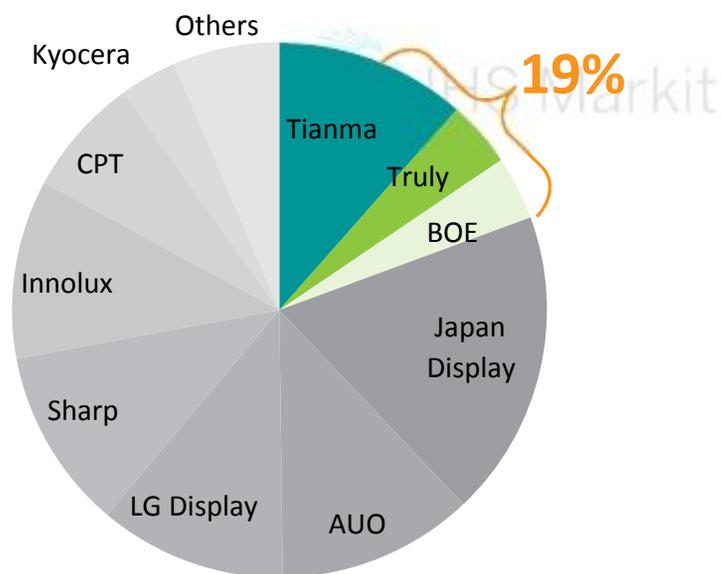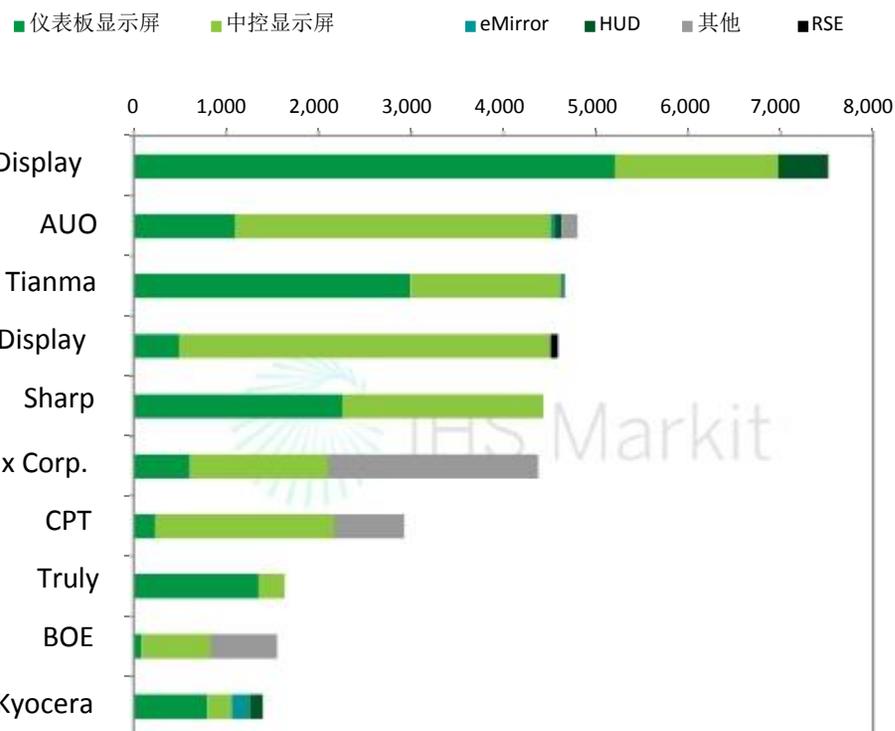- Truly — 5.5%

© 2018 IHS Markit

注：Tianma与Tianma Japan （NLT）合并计算

来源：IHS Markit Automotive Display Market Tracker
IHS Markit 汽车显示器市场跟踪

汽车已成为面板供应商的一个重要应用市场

2018年一季度各供应商汽车显示面板出货量份额
——所有应用市场（PMLCD和PND除外）

图例：■ 仪表板显示屏　■ 中控显示屏　■ eMirror　■ HUD　■ 其他　■ RSE

19%

饼图标签：Others, Kyocera, CPT, Innolux, Sharp, LG Display, AUO, Japan Display, BOE, Truly, Tianma

柱状图标签（纵轴）：Japan Display, AUO, Tianma, LG Display, Sharp, Innolux Corp., CPT, Truly, BOE, Kyocera

横轴刻度：0, 1,000, 2,000, 3,000, 4,000, 5,000, 6,000, 7,000, 8,000

注：包括所有应用，包括中控显示屏、仪表板、后视镜、抬头显示器、后座娱乐系统和其他汽车监视器（售后市场）。
来源：**IHS Markit Automotive Display Market Tracker**

- 市场重新洗牌：中国企业不断崛起

- **供应链正在进化：CDC改变行业格局**
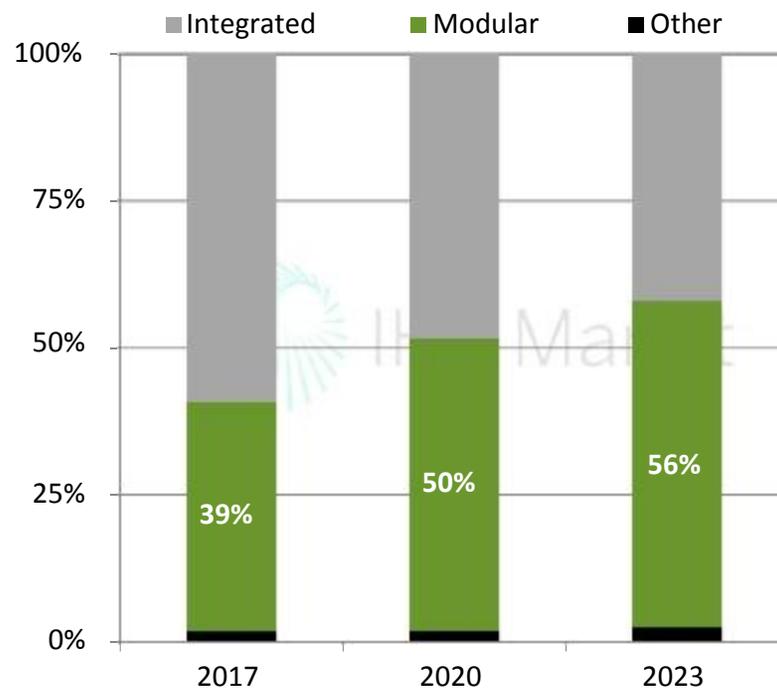
- 2018年国际显示周展示的相关技术：下一代汽车显示器将会是什么

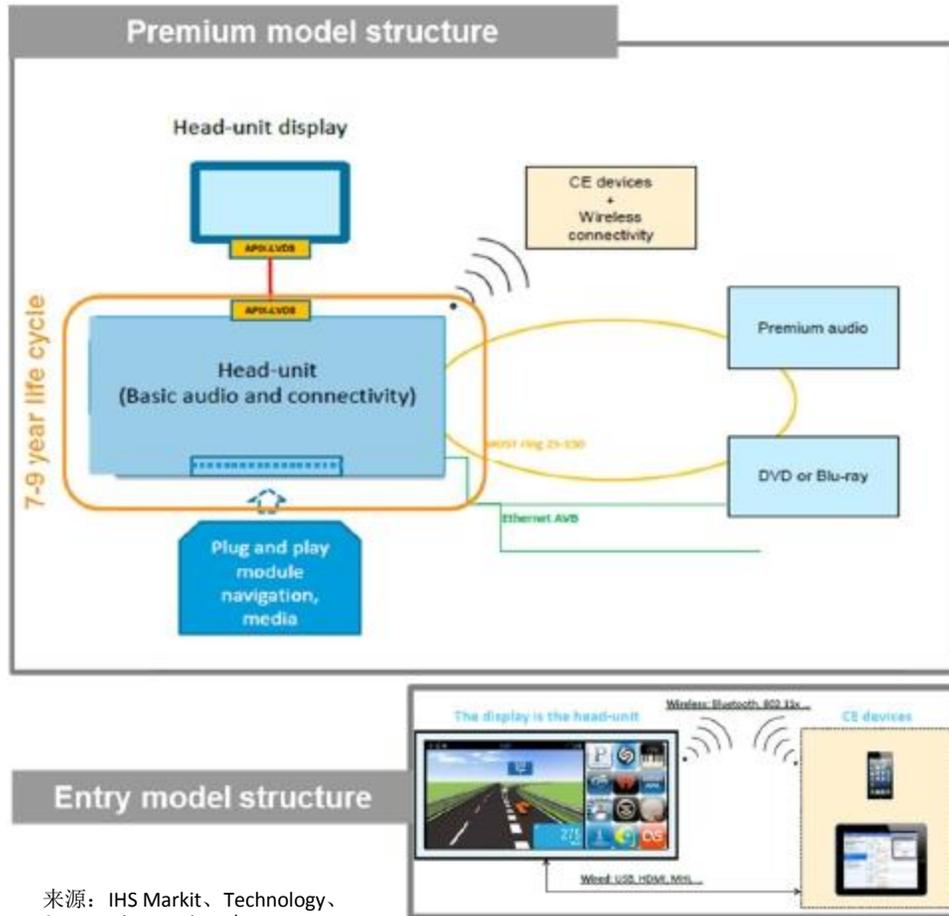- 结语

悬浮式模块化中控显示屏设计越来越流行

2018年北京车展上的悬浮式中控显示屏设计

中国：各类型中控显示屏出货量

- Integrated
- Modular
- Other

	2017	2020	2023
Modular	39%	50%	56%

来源：IHS Markit l Automotive

模块化设计缩短了中控显示屏的产品生产周期并简化了设计

来源：IHS Markit、Technology、Automotive semiconductor

拆解：阿尔派奥迪A3/S3平视显示器（8V0857273N）

53.7%   0.4%   27.8%   18.1%

- ■ Display Module
- ■ Other- Enclosures/Final assembly
- ■ Main PCB
- ■ Motor RPM Sensor PCB

来源：IHS Markit、Technology Teardown
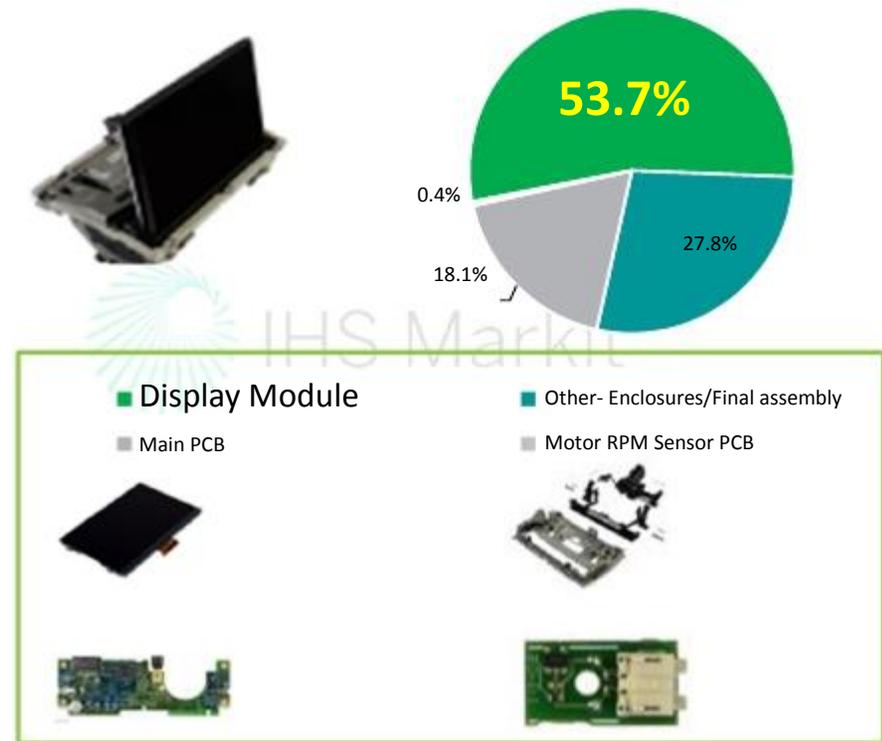
实现C.A.S.E需要可扩展和灵活的硬件及软件平台

C.A.S.E正在重塑汽车架构
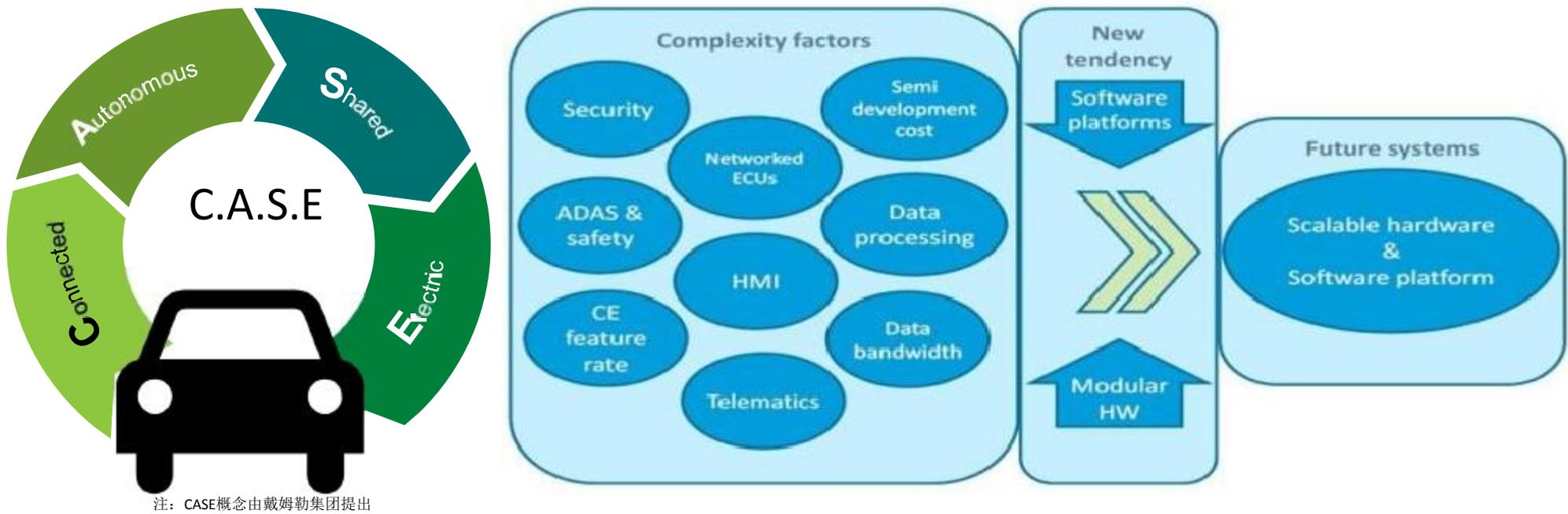
注：CASE概念由戴姆勒集团提出

来源：IHS Markit l Technology

座舱电子域控制器（**CDC**）已经成为汽车显示器行业的改变者

座舱电子域架构示例
对生态系统的好处和潜在影响

Benefits

- Significant cost savings ($100-200USD per car) - # of ECU, # of wires
- System weight reduction (fuel economy up)
- Reduce assembly cost and complexity
- Increase scalability and upgradeability as more "dummy" displays with no dedicated ECU attached

Remote Display"s"

Cockpit domain controller

IVI/Audio/TCU or IC   IC/HUD

In-Vehicle Infotainment (IVI) Controller
Audio/Radio Controller
Telecom Control Unit (TCU) / Wireless gateway
Gesture Controller
HVAC Controller
Instrument Cluster (IC) Controller
Head up Display (HUD)

Other disaggregated ECUs ...

Source: IHS Markit Automotive Display Market Tracker

Impacts on ecosystem

- Have to solve the worry of security and put all the eggs in one basket.
- Have to work with chip manufactures, software providers and other 3rd parties.
- OEM will need to restructure auto E/E architecture and even organization (engineering, design, product planning, and procurement)
- Simplified the supply chain, but current stable display supply chain will be challenged.

© 2018 IHS Markit

多家一级供应商已经实现**CDC**量产或者已经拥有解决方案

一级供应商座舱电子域控制器解决方案示例

产品、特点和获得的业务

IVI= in vehicle infotainment, including navigation, display audio, RSE, etc.

| Product	Features and Biz Win	Product	Features and Biz Win
Integrated Cockpit Controller (ICC) **APTIV**	IVI　ICD　HUD • Intel Atom Processor E3900 series • Support up to four high-definition displays– CSD, Cluster, HUD, and rear seat display. • Ferrari ('18 SOP), Audi ('18/'19 SOP), Volvo ('20 SOP), FAW ('21 SOP)	**Smart Core** **Visteon®**	IVI　ICD　HUD • Support for Renesas, Nvidia, and Qualcomm CPUs; digital instrument cluster, HUD, infotainment and optional passenger display; support 3D display and AR-HUD • Daimler ('18 SOP), DFM ('18 SOP), European OEM ('20 SOP), Geely ('18 SOP)
MAGNETI MARELLI	IVI　ICD • Scaling software and display across cluster, infotainment and more. • PSA ('20 SOP)	**Integrated Interior Platform (IIP)** **Continental**	IVI　ICD　HUD　Mirror • Controls all input/out devices and mobile devices • Links to other road users, infrastructure and the cloud (V2X connectivity controller) • European OEM ('21 SOP)
Digital Cockpit Platform **HARMAN**	IVI　ICD　HVAC　Mirror • seamlessly integrate the instrument cluster with center console via voice, haptic feedback, and physical knobs and steering wheel controls in a single center screen. • OLED, QLED	**SPYDR** **Panasonic**	IVI　ICD　HUD　Mirror • a single brain cockpit domain controller solution directing multiple functions within the vehicle, including an infotainment center stack display, eMirror, digital instrument cluster, and head-up display (HUD).

来源：IHS Markit Automotive Display Market Tracker
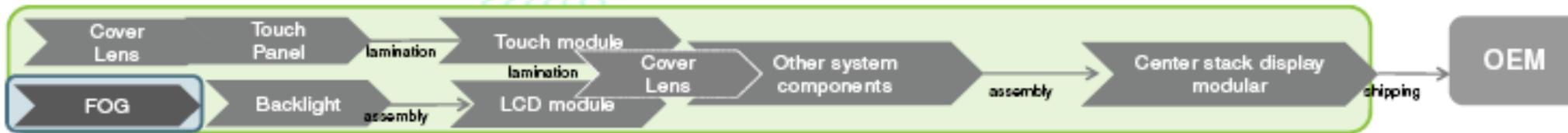
两种极端供应链商业模式正在出现

新兴供应链商业模式示例

面板制造商作为一级供应商
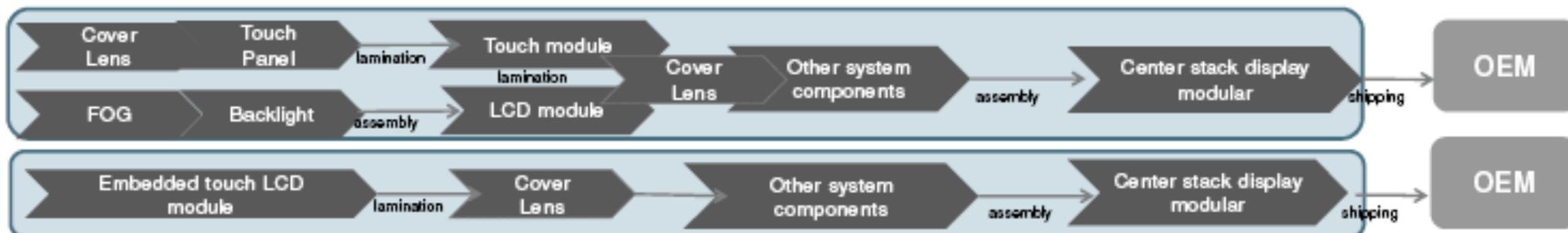
- 通过只供应悬浮式显示器，面板供应商更容易成为一级供应商。汽车制造商对降低成本（减少一级供应商利润）以及供应链简化（提升供应链状态可见性）也表示欢迎。
- 除了CSD之外，仪表板、HUD和eMirror市场也在计划之中。但是，这会影响面板供应商与一级供应商之间关系。

一级供应商作为模块制造商

面板制造商

- 为了控制总成本，提高其在供应链中的影响力，一级供应商正试图采购FOG*，然后自己负责组装模块/盖板镜头。

Note: FOG (FPC on glass), 不含背光模组出貨型態

来源：IHS Markit Automotive Display Market Tracker

会
议
日
程

- 市场重新洗牌：中国企业不断崛起

- 供应链正在进化：CDC改变行业格局

- **2018年国际显示周展示的相关技术：下一代汽车显示器将会是什么**

- 结语

迷你LED/微型LED和柔性AMOLED是本次展会的主题

2018年国际显示周展出的主要显示技术

	Free Shape ; Slim boarder; Ultra high PPI ; Low power	HDR, Local dimming, low power consumption	The next generation display?	curve, foldable, rollable, unbreakable	Convergence of reality and information	pillar to pillar	In-cell touch, reduce thickness	Wide color gamut QD Glass QD pixel	Multi-layer display	Biometric identification
	LTPS LCD	**Mini LED BLU*LCD**	**Micro LED Display**	**Flexible AMOLED**	**Transparent Display**	**Ultra Wide (combined) Screen**	**Touch Embeded Display**	**Quantum Dot**	**Glass-free 3D Display**	**Fingerprint Recognition**
Automotive	✕	✕		✕	✕	✕	✕	✕	✕	
TV		✕	No specific application		✕	✕		✕		
IT (MNT/NB)	✕	✕								
Smartphone	✕	✕		✕			✕			✕
Head Mounted Device	✕	✕								
Other Application	✕	✕			✕		✕			✕

注：" **X**" 表示在车展上有产品展示

来源：IHS Markit Automotive Display Market Tracker

LTPS LCD显示屏正从智能手机应用扩展至汽车应用

2018年国际显示周上展示的车用LTPS LCD

来源：IHS Markit Automotive Display Market Tracker

LTPS LCD为汽车显示屏带来产品价值

LTPS LCD 在汽车各类显示屏中的应用价值

Applications	Values
Head up display	**Performance:** High PPI, High brightness
Center stack display	**Cost:** saving module cost (less LED chips, driver cost, smaller PCB) **Design:** better outlook (slim boarder, freeform)
Instrument cluster	**Performance:** less thermal issue, MLD, high brightness **Design:** better outlook (slim boarder, freeform)
eMirror	**Performance:** high brightness **Design:** better outlook (slim boarder, free form)

来源：IHS Markit Automotive Display Market Tracker

面向汽车行业的**LTPS LCD**出货量预测
百万台

© 2018 IHS Markit
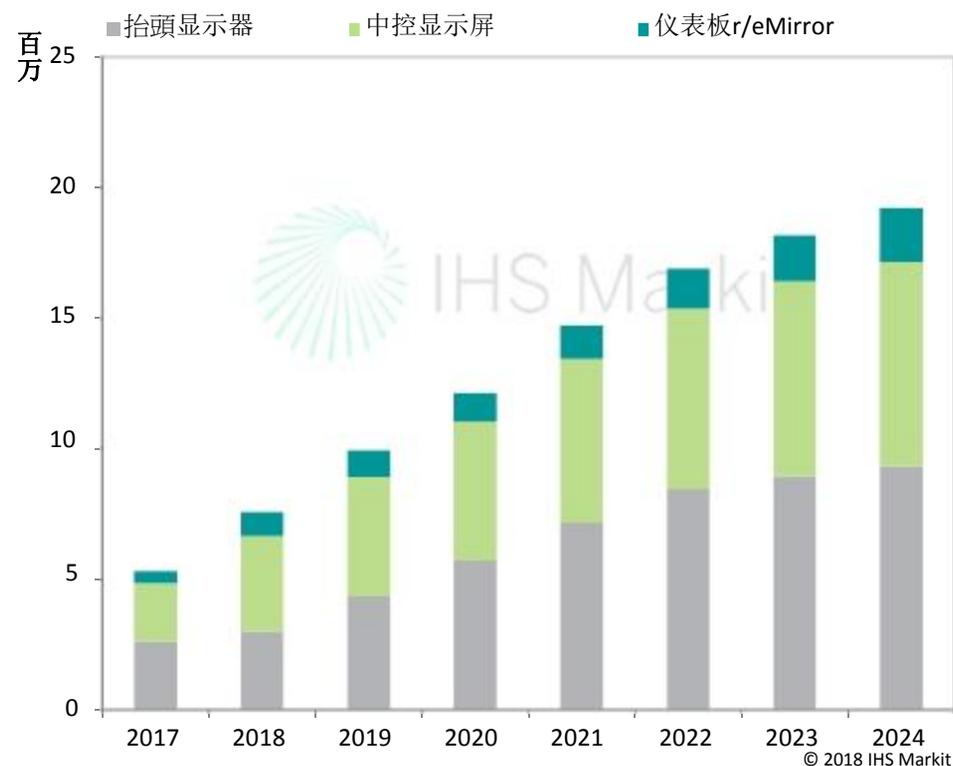
三星再次推出汽车用**AMOLED**显示屏

Samsung Display

BOE

Tianma

ZTIANMA

6.22" Unbreakable AMOLED
- 1440x2960(529 ppi)
- 420(HBM 600) nits
- >500,000:1
- 100% NTSC
- Test: (Head) 6.8kg, (Drop) 2.3m

12.3" curved AMOLED
- 1920x720(167 ppi)
- 400(HBM 800) nits
- >500,000:1
- 100% NTSC
- 1000R curvature

14" Rollable AMOLED
- 960x540(78 ppi)
- 350 nits
- 10R curvature
- Single bank (Portrait)

12.4" S Curve AMOLED
- 1200x1920(182 ppi)
- 400(HBM 800) nits
- >500,000:1
- 100/140R(Convex/ Concave)
- 100% NTSC

12.3 FHD Flexible for automotive
- 1920 x 720
- 600 nits
- >90% NTSC
- 60Hz
- Power Consumption 14W; 0.5 mm thickness

4.2" AMOLED for Automotive
- 480×272
- 800 nits
- >40000:1
- High brightness

来源：IHS Markit Automotive Display Market Tracker

Elegant Interior Design

Innovative and unique design possible

OLED, No liquid Crystal
- Cell gap distortion cause a light leakage

No Color Filter, No Black Light Unit

LCD   OLED

High Picture Quality

True black enhances overall interior value & driving safety

LCD   OLED

Source: Samsung

AMOLED正在进入汽车市场，但存在一些障碍

AMOLED capacity for automotive

	3.x/4.x	5.x	6.x
AUO	G4.5 4B (under planning)		
BOE	G4.5 Chengdu (RD sample)		G6 Mianyang （计划中）
INX	G 3.25 T3/Fab 1 (under planning)		
JDI/ JOLED			G5.5 Nomi （计划中）
LGD	G4 E2 (RD sample)		G6 E5 （柔性）（研发中）
Samsung	G4 A1* (Rigid)	G5.5 A2 （柔性）（计划中）	

AMOLED panel shipment forecast for automotive

Million units

- Cost / Performance ?
- Reliability ?
- Suppliers ?

'17 '18 '19 '20 '21 '22 '23 '24

'17 '18 '19 '20 '21 '22 '23
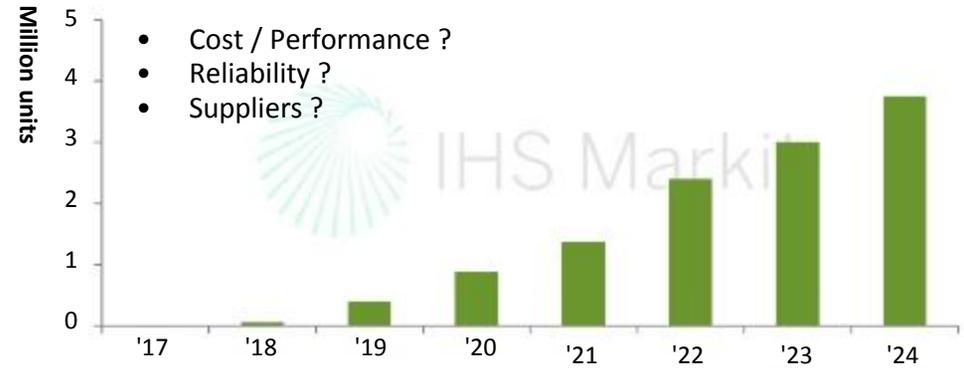
- '17: Rear seat remote controller (Rigid)
- eMirror
- '19 Instrument cluster Display and center stack display
- '23 HUD (Transparent?)

IHS Markit Automotive Display Market Tracker

采用Mini LED背光设计的LCD面板在展会上很受欢迎

2018年国际显示周上展出的Mini LED和背光设计产品

AUO's 2" LTPS LCD
Head Mount Display
1024 dimming zones

BOE's 3.5" HDR
Head Mount Display
720 dimming zones

BOE's 5.99" FHD+
Smartphone
na
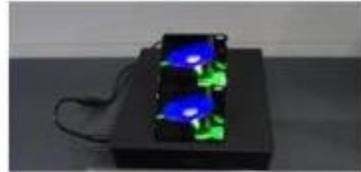
AUO's 6" FHD+
Smartphone
48 dimming zones

Tianma 6.4" HDR
Smartphone
286 dimming zones

Tianm's a5.0" a-Si
Circular IoT
na

BOE 12.3 FHD
Automotive
na

AUO's 15.6UHD 4K
Notebook
240 dimming zones

AUO's 27" UHD 4K
Gaming Monitor
240 dimming zones

BOE's 27" UHD
Gaming Monitor
na

JDI 16.7" 1800x2880
Automotive
104 dimming zones

Tianma 12.3 FHD
Automotive
240 dimming zones

LGD 16.2 CDD
Automotive
na

来源：IHS Markit Automotive Display Market Tracker

直下式背光：局部调光以节约能源并提高能见度

LCD Global Dimming

OFF | ON

Traditional local dimming
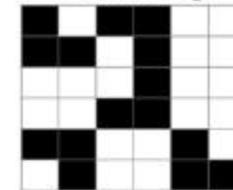
LCD Local Dimming

AMOLED-like pixel dimming

OLED Pixel Dimming

Structure	**Traditional D-LED BLU + 2nd lens**	**Dual Cell**	**D-LED BLU By Mini LED**
	DBEF-D (low-power solution) Prism film Diffuser film Diffuser plate LED + 2nd Lens Reflector film	BLU Dimming control cell	COB (Chip on Board) type Micro/Mini LED array LCD Panel Optical film stacking LED array LED chip Substrate: FPCB, PI, etc.
	Use normal size LED chip as direct backlight	Add one dimming control cell	Use W-LED/RGB LED mini LED chips for backlights
	▼ HALO (Blooming) effect is easily seen in btw bright and dark zones. ▼ Larger optical distance (OD) ▼ High cost (more LED chips and need 2nd lens)	▼ Unable to do curve ▼ OD will become larger ▼ High cost (extra array, polarizer, extra T-con required dimming algorithm)	▲ Better uniformity performance (no Halo) ▲ Smaller optical distance (OD) ▼ Highest cost **Cost / Performance?**

来源IHS Markit Automotive Display Market Tracker

透明平板显示屏再次亮相

TFT LCD Technology

BOE
- 8" Waveguide Display
- T>80%

JDI
- 4" Highly Transparent Color Display
- T=80%

uLED Display
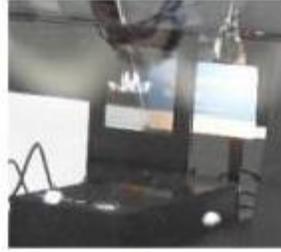
Playnitride
- 2.65" RGB uLED Display
- T~50%

AMOLED Technology

AUO
- 13" Transparent AMOLED for AR
- T*=68%

LGD
- 77" Transparent Flexible OLED
- T=40%

SDC
- 4.94" AMOED for automotive
- T=44%

Transparent technology comparisons

Type	TFT LCD		AMOLED		Micro LED
	Conventional	JDI's Technology	Conventional	AUO's Technology	Playnitride's Technology
T %	5%~10% / 30%	80%	45%~	68%	~50%
Principal	Light absorption (shutter)	Light guide/ scattering	Emitting	Emitting (patterning cathode)	Emitting
Polarizer	Have	NO	NO	NO	NO
Color Filter	Have/ No	NO	Have/No	NO	NO
Full color	YES	YES	YES	YES	YES
When not use	Semi-see through	See-through	See-through	See-through	See-through

Note: * T: Transmittance
Source: IHS Markit Automotive Display Market Tracker—Actual—Q1-2018

超宽座舱显示屏：是否是未来趋势？

面向汽车应用的超宽（组合式）显示屏展品

JDI : 4 x 12.3-inch with one cover lens

Tianma : 3 X 12.3-inch with one cover lens

BOE: 42" 3 X 12.3-inch with one curved cover lens

JDI Automotive Cockpit Displays for the Near Future
- 3 x 12.3-inch with one curved display

Benefits
- **High size flexibility**
  - can combined with several screen sizes mix. For example, 2*10.25", 1*12.3" + 8"/10" or 12.3" + 15.6", etc.
- Able to provide more features
- Sleek cockpit outlook design
  - one cover lens

Challenges
- Large size interior space
- Cover lens supply
  - Giant size cover lens
  - Sometimes required curved cover lens
  - Require special surface treatment (anti-glare, anti-reflection, anti-smudge)
  - Full lamination
- Beyond touch function UI
  - Gesture touch (hovering, proximity, etc.)
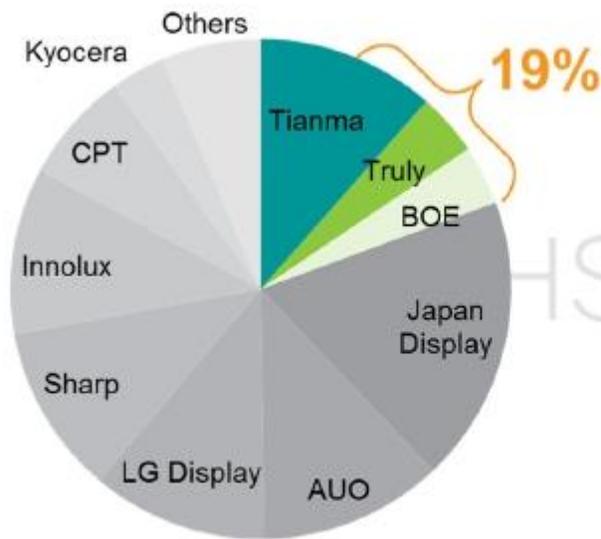
来源：IHS Markit Automotive Display Market Tracker

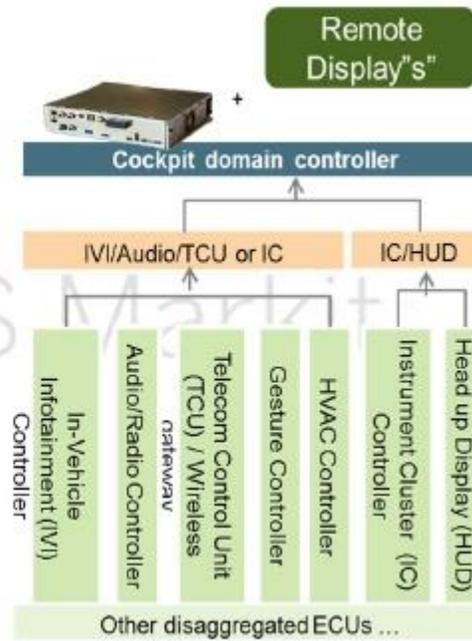<div style="writing-mode: vertical">会议日程</div>

- 市场重新洗牌：中国企业不断崛起

- 供应链正在进化：CDC改变行业格局

- 2018年国际显示周展示的相关技术：下一代汽车显示器将会是什么

- 结语

汽车显示行业正在发展，面板的重要性日益突出

中国显示器企业崛起

新兴商业模式

技术竞争

来源：IHS Markit Automotive Display Market Tracker

等等

重要指导

密切关注供应链活动

- 悬浮式CSD设计和未来座舱中心域控制器将重塑显示器供应链。
- 必须关注的供应链活动：面板供应商的商业模式、破产和关厂。一级供应商的合并和收购。

重新思考商业模式

- 预计面板产量和面积将稳步增长，但激烈竞争将给面板价格带来压力，导致企业收入停滞不前。供应商通过传统方式将无法维持其盈利能力，只能增加产量弥补价格下降。
- 供应商需要通过扩大产品阵容增加每辆车中的显示屏内容或通过多元化经营其他相关或非相关领域来确保未来增长。

确保成为新一代行业参与者

- 连接性、共享移动出行和自动驾驶为汽车内饰设计提供了新的可能。
- 新的HMI需要更好的显示技术支持产品创新。
- 许多新供应商将重点放在具有增长潜力的技术上，进一步增加竞争压力。

定义和缩略语

Major automobile monitor display panel application definition: by location

❸ **Head-up display (HUD)**

TFT LCD panel that used as image source for factory-installed combiner type, windshield type, and AR-HUD.

❹ **Side eMirror (eMirror)**

Display panel to show image of camera monitor system

❷ **Instrument cluster display (ICD)**

Display panel for driver information, including hybrid type and full digital cluster display

❻ **Automobile Monitor (Others)**

Whitebox and unidentified applications.

❹ **Rearview eMirror (eMirror)**

Display panel to show image of camera monitor system

❶ **Center stack display (CSD)**

Display panel located in the center of cockpit, including navigation, display audio, climate control panel, etc. Whitebox shipments are counted in other automobile monitors

❺ **Rear seat entertainment display (RSE)**

Display panel located at rear seat, including headrest and armrest display.

Note: Passive type display, which is mainly below 3-inch and mono color is excluded in this presentation, and counted into 'automotive' in IHS Markit Automotive display market tracker.
Source: IHS Markit

© 2017 IHS Markit