



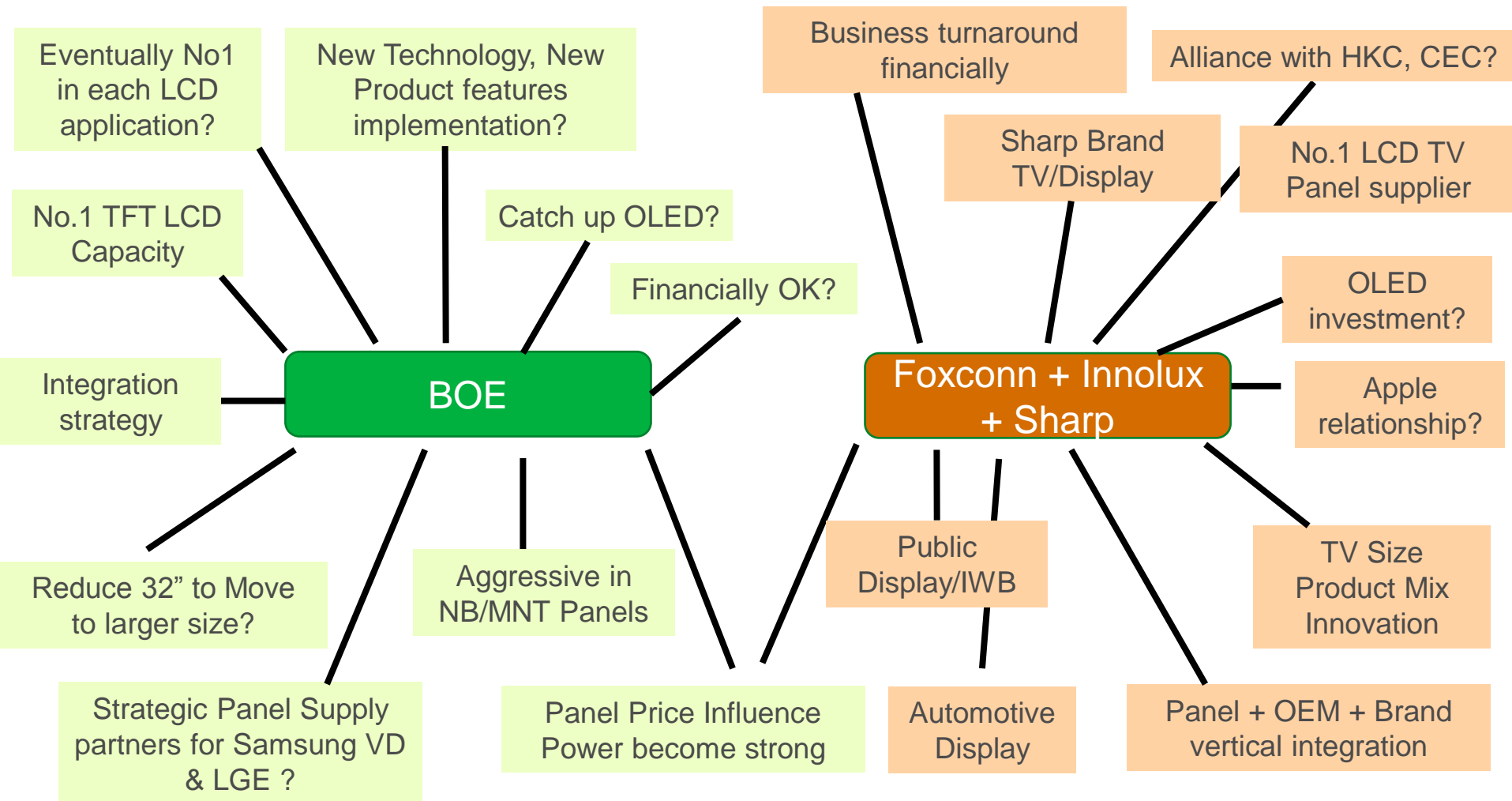
IHS Markit™

2017 China and Taiwan Display Industry Trend and Players' strategies

2016.11.2 for IHS Technology Korea Display Conference

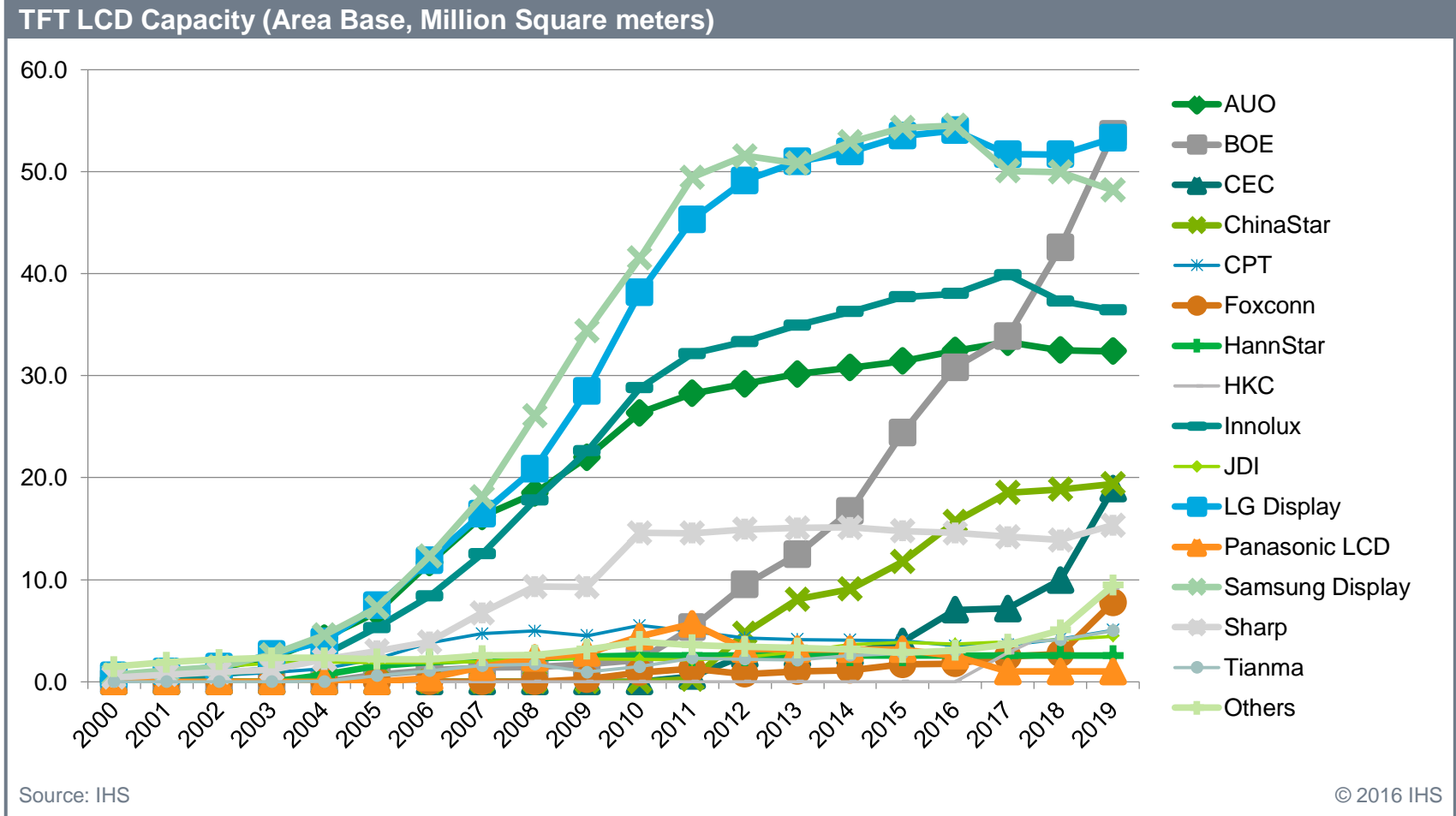
David Hsieh, Senior Director, Displays IHS
Technology

Two Companies Influencing Display Industry in 2017



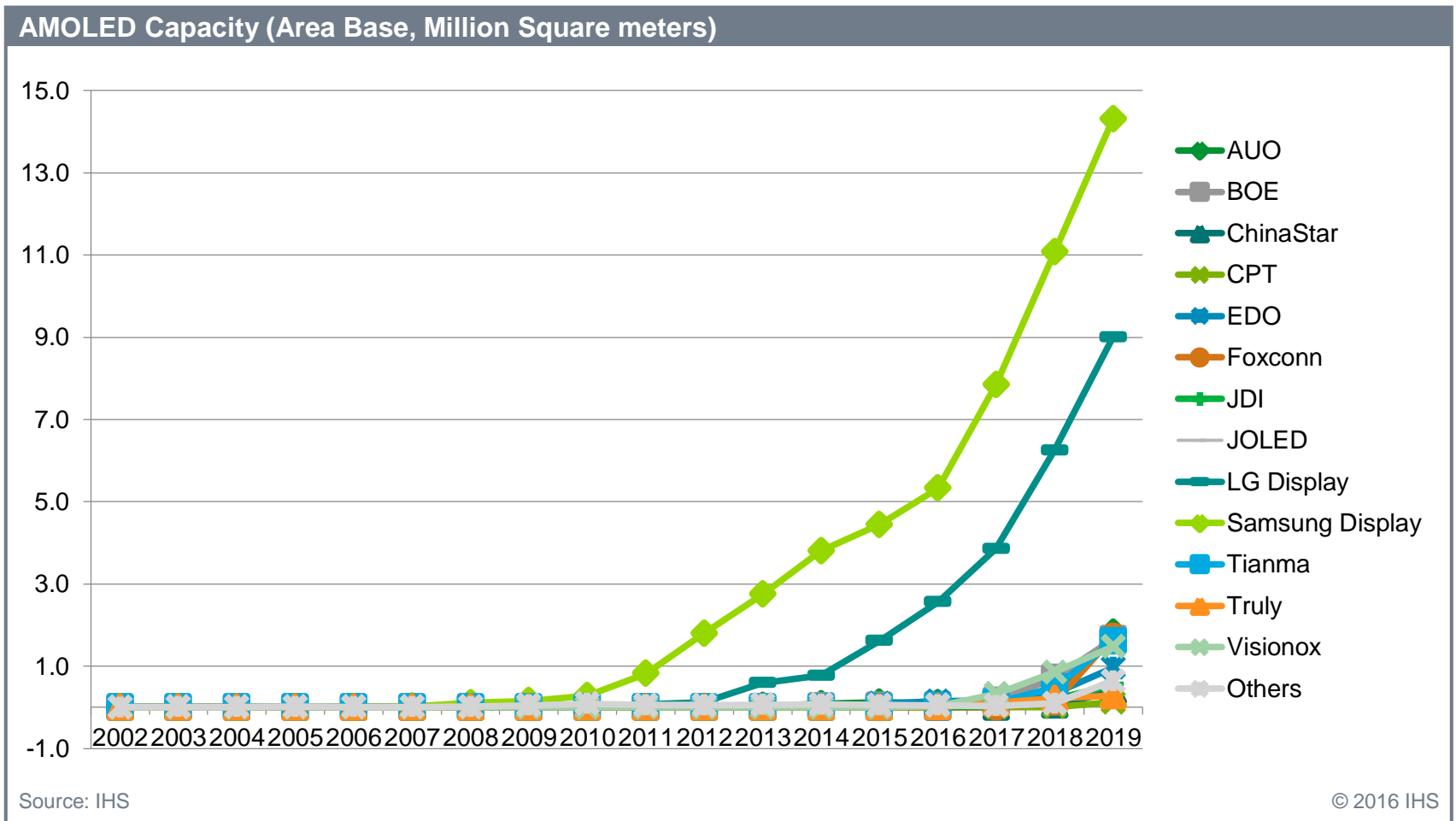
BOE No.1 TFT LCD Capacity in 2019

- Foxconn (Century, Innolux, Sharp) has the largest TFT LCD capacity in 2017. Samsung Display continue to reduce its TFT LCD capacity. Gen10.5 will be the kick off for BOE to become No.1 W/W TFT LCD capacity owner.



China OLED Capacity Far Below Korea, But Growing

- 2016 : Samsung Display + LG Display AMOLED Capacity vs. China Capacity = 7.9M m² v.s. 0.2M m²
- 2019 : Samsung Display + LG Display AMOLED Capacity vs. China Capacity = 23.3M m² v.s. 4.8M m²

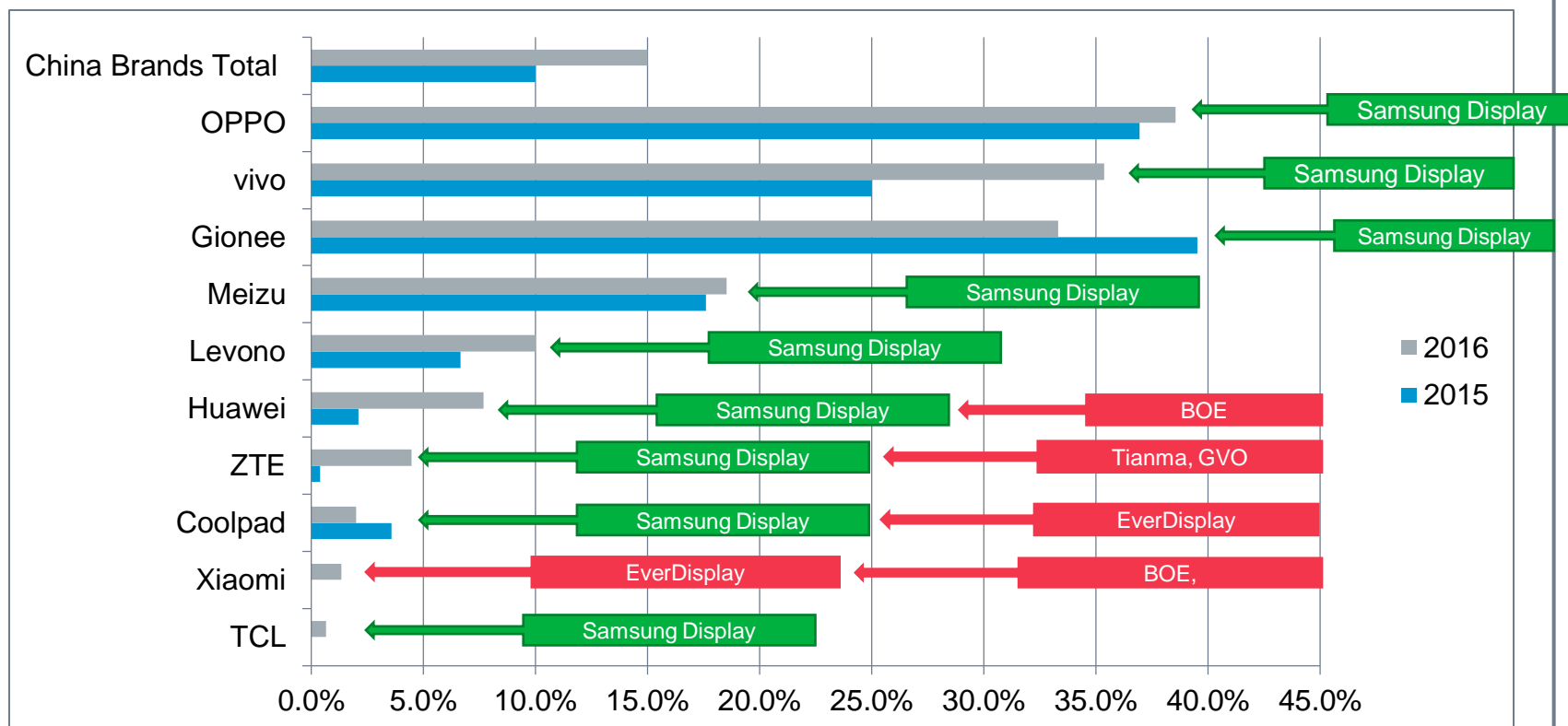


China Smartphone brands have started to use China OLED

- Chinese smartphone brands purchased approximately 50 million OLED smartphone displays in 2015. This will grow to more than 85 million in 2016, including flexible.

← OLED Panel Source

OLED penetration in Smartphone by China Makers



Source: IHS

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China FPD Investment



Gen8 (Gen8.5) Fab in China

- Local government support is important for China LCD makers.
- BOE is aiming to be No.1 TFT LCD capacity. BOE's model is to gain support from many local governments. ChinaStar is to mainly support the mother group TCL. CEC is investing in TFT LCD for the new momentum of the government-own enterprise.

China Gen8 & Gen10/11 Above Fab Status 2016-2018

Gen8 +	BOE	ChinaStar	CEC	HKC	Samsung	LG Display
MP	Beijing (北京) B4	Shenzhen (深圳) T1	Panda Nanjing (南京) Oxide Gen8		Suzhou (蘇州) Fab	Quangzhou (廣州) Fab
	Hefei (合肥) B5	Shenzhen (深圳) T2				
	Chongqing (重慶) B8					
Under Construction	Fuqing (福清) B10	Oxide & Gen8.6+	Panda Chengdu (成都) Gen8.6	Chongqing (重慶) HKC Gen8.6		
	Hefei (合肥) B9 (Gen10.5)		IRICO Xianyang (咸陽) Gen8.6			
Under Planning	Dalian (大連) B12	Shenzhen (深圳) T5 (Gen10.5/Gen11)	Same size as Gen10.5			
	Chongqing (重慶) B13 Oxide+OLED TV	For OLED TV				

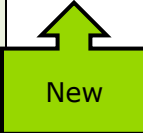
By 2018
China will have

- 10 Gen8 (including one Oxide Gen8 Fab)
- 2 Gen10.5/Gen11 Fab (one under construction)
- 4 Gen8 (including Gen8.6) Under Construction

Gen5.5+ in China :a-Si, LTPS, Oxide, OLED

- LTPS + AMOLED is the main theme for investment. LTPS for smartphone displays. OLED as the technology upgrade and preparing for the flexible form factor.

China Gen5.5, Gen6 Fab Status 2016-2018

Gen5.5+	BOE	ChinaStar	CEC	Tianma	AUO	CPT	Ever Display	Foxconn	Visionox
MP	Ordos (鄂爾多斯) B5 LTPS+OLED Gen5.5		Panda Nanjing (南京) a-Si Gen6						Kunshan (昆山) LTPS+OLED Gen5.5
	Hefei (合肥) B3 a-Si Gen6								
Under Construction	Chengdu (成都) B7 LTPS+OLED Gen6	Wuhan (武漢) T3 LTPS+OLED Gen6		Xiamen (廈門) LTPS+OLED Gen6	Kunshan (昆山) LTPS Gen6	Putian (福建莆田) CPT-TG Oxide Gen6			
				Wuhan (武漢) LTPS+OLED Gen6					
Under Planning	Mianyang (綿陽) B11 LTPS+OLED	Wuhan (武漢) T4 (LTPS+OLED)					Shanghai (上海) Fab 2 LTPS+OLED Gen6	Guizhou (貴州) Project 901 LTPS+OLED Gen6	Guan (固安) Project LTPS+OLED Gen6
								Zhengzhou (鄭州) Project 816 LTPS+OLED Gen6	

By 2018

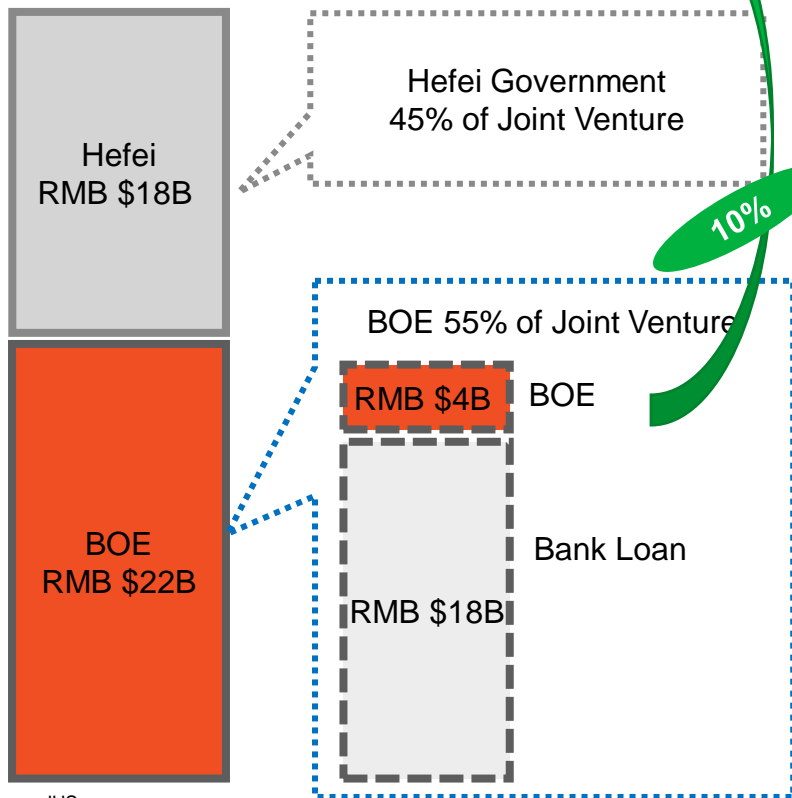
China will have possibly

- 2 Gen5.5 LTPS+OLED
- 2 a-Si Gen6
- 1 Oxide Gen6
- 5 Gen6 LTPS (+ OLED)

BOE Investment Structure (Example Gen10.5 & Gen8)

BOE Hefei Gen10 Fab B9 Fab Investment

- BOE in Hefei (合肥) Gen 10.5
- Total Investment: RMB 40B (US\$6.6B)
- Joint Venture with Hefei Government

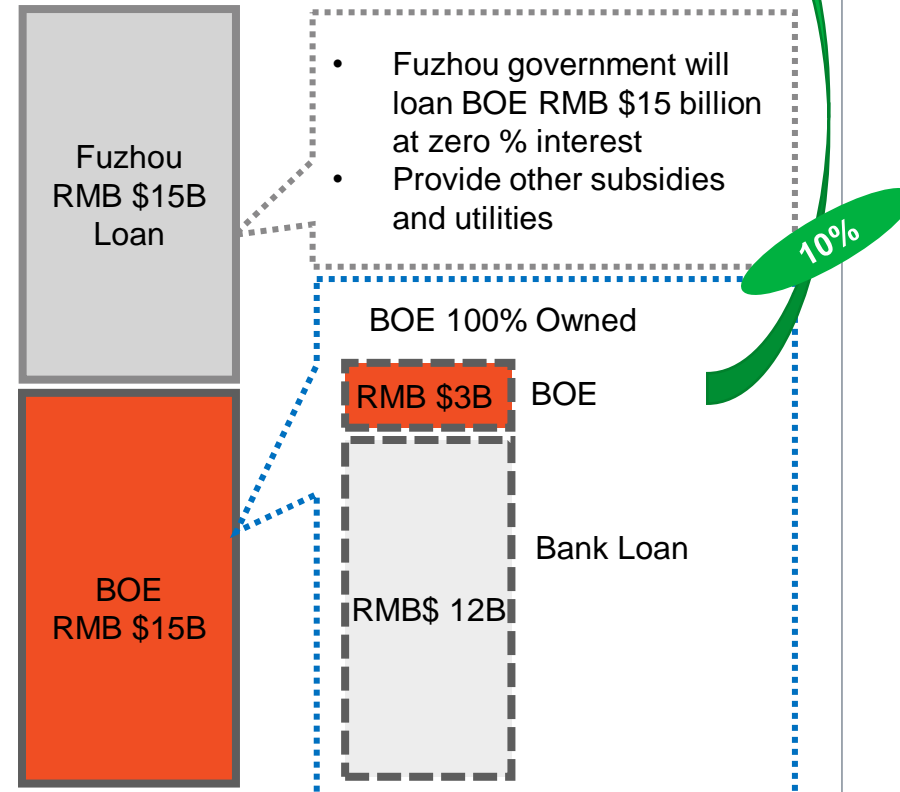


Source: IHS

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BOE Fuqing Gen8 Fab B10 Fab Investment

- BOE Fuqing (福清) Gen 8
- Total Investment: RMB 30B (US\$5B)
- Assume factory will be wholly owned by BOE, but Fuzhou government facilitates all the financial and provides other support.



Source: IHS

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China Makers Strategy



BOE: Business strategy

BOE's strategy

Capacity expansion

	Gen.	Location	Tech.
B1	5	Beijing	a-Si
B2	4	Chengdu	a-Si
B3	6	Hefei	a-Si/Oxide
B4	8	Beijing	a-Si
B5	8	Hefei	a-Si/Oxide/OLED
B6	5.5	Ordos	LTPS/AMOLED
B7	6	Chengdu	AMOLED
B8	8	Chongqing	a-Si/Oxide
B9	10.5	Hefei	a-Si/Oxide
B10	8	Fuqing	a-S
B11*	6	Mianyang	LTPS/AMOLED
B12*	8	Dalian	a-Si
B13*	8	Chongqing	Oxide AMOLED

* = Under planning or discussion with government

Set business

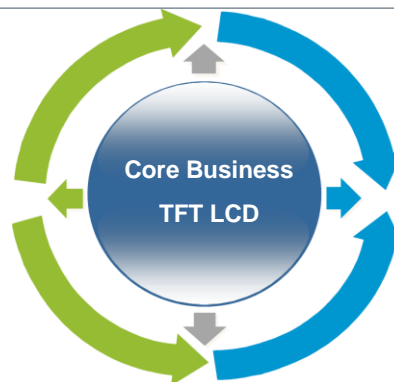
- BOE SBG (Set Business Group)
- BOE SO SBU (Set OEM Business Unit)
- BOE BM SBU (Backlight Module Business Unit)

TV OEM Customers

Haier, Samsung
VD, Skyworth
Sony, Tongfang,

BOE's own brands

- BOE VT: Monitor, BiTV
- BOE Lighting
- BOE Solar
- BOE Health Care (wearables)



Panel business

- Panel: sizes 1-110", max resolution 8K
- Tech: TN, FFS/IPS
- Applications: Notebook, TV, monitor, phone, tablet, industrial, automotive

IT Customers

Apple, Acer, ASUS, Dell,
HP, Lenovo, Samsung,
Huawei, LGE, Foxconn,
TPV, Qisda, BOE

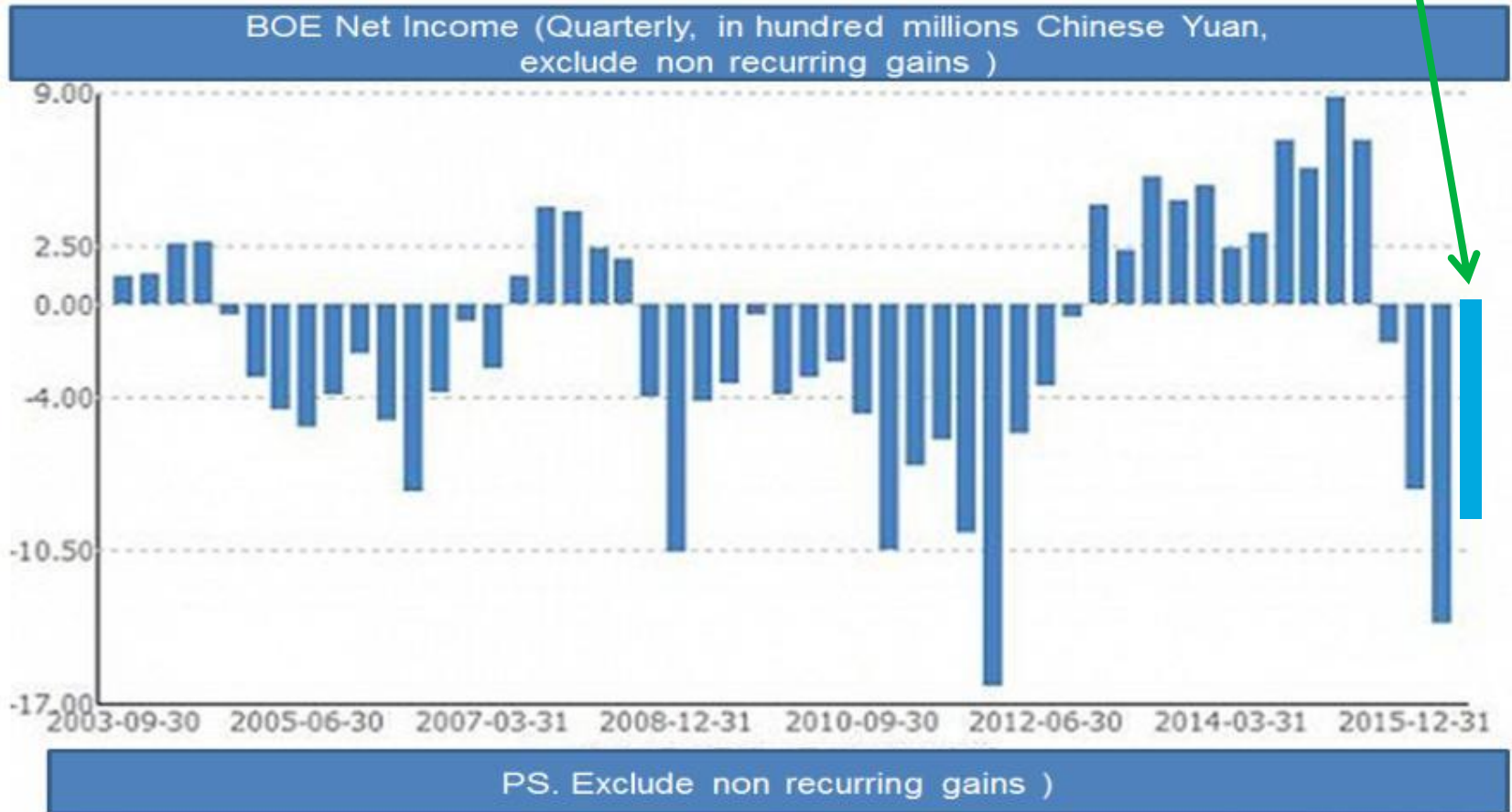
TV Customers

Samsung, BOE, Vestel,
TPV, LGE, Changhong,
Hisense, Konka, MTC,
Skyworth, Sony

BOE – Making Money or Not?

BOE Net Income (In hundred millions Chinese Yuan)

1H'2016 loss -5.5 hundred millions Chinese Yen



Source: China Stock Market Open Informaiton

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BOE Exhibition in SID 2016

- TVs:
 - > **82-inch curved 10K TV (10240 × 4320)**
 - > 65-inch 8K (7680 × 4320) with an LCM that is 3.8 mm thick
 - > 98-inch 8K (7680 × 4320) with HDR
- IT & Mobile:
 - > 15.6-inch UHD notebook panel with an oxide backplane
 - > 10.1-inch UHD naked eye 3D tablet panel
 - > 6.8-inch UHD smartphone with a 1.2 mm slim module
 - > 5.5-inch UHD naked eye 3D smartphone panels
 - > **2.8-inch UHD module for VR. With a ppi of 1574**
- **Flexible 4.35-inch (1120 × 480) bendable and foldable panels.**
- 34-inch curved monitor (3440 × 1440)
 - > **12.3-inch curved automotive display (1920 × 720)**
 - > 7" displays that are shaped like letters of the alphabet (1920 × 1080)
 - > 1.39-inch circle OLED display for wearables (454 × 454)

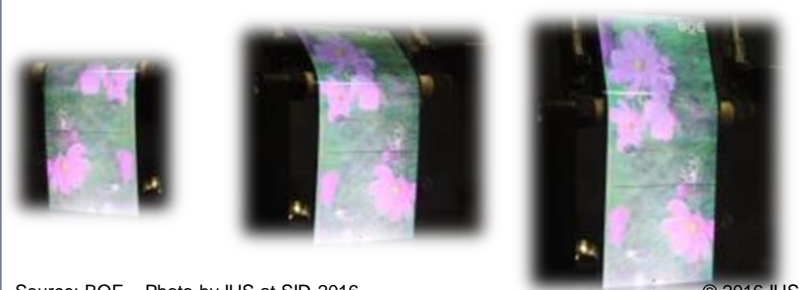
BOE – 82" curved 10K TV



Source: BOE – Photo by IHS at SID 2016

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BOE – 4.35" foldable mobile display



Source: BOE – Photo by IHS at SID 2016

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BOE – Freeform automotive display



Source: BOE – Photo by IHS at SID 2016

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BOE Exhibit in SID – High performance mobile display

BOE – High performance mobile display



- 5.7" QHD rigid OLED
- Contrast: 20,000:1
- Color gamut: 100% NTSC
- Brightness: 350 nits
- Response time: max 10 ms
- 5.2" FHD narrow border LCD
- Module border: 0.7 mm
- Touch mode: FIC/TDDI
- 5.5" FHD narrow border LCD
- Module border: 0.7 mm
- Touch mode: FIC/TDDI
- 6.8" UHD ultra-slim module LCD
- Thickness: 1.2 mm
- Color gamut: 92% NTSC
- Brightness: 450 nits

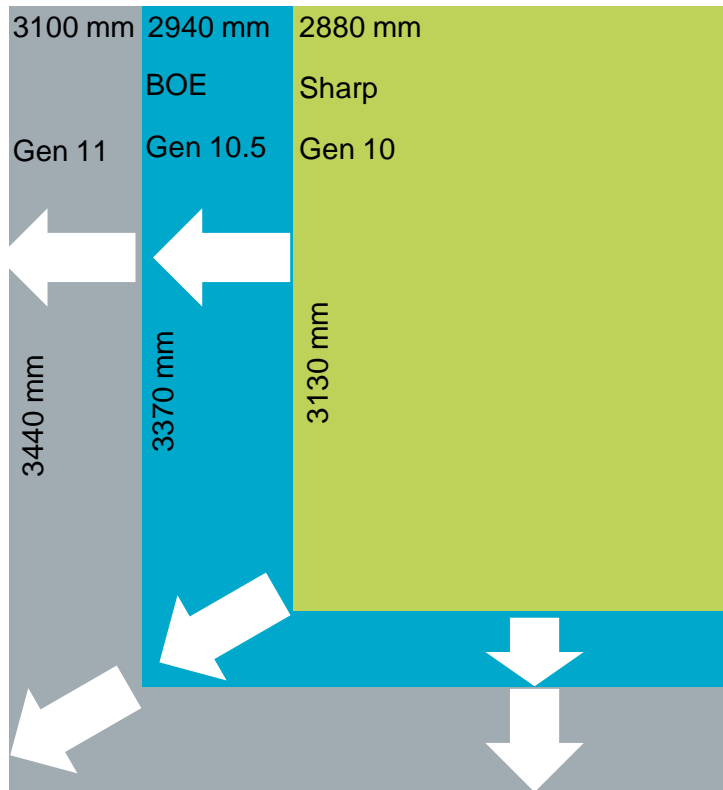
Source: BOE – Photo by IHS at SID 2016

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Gen10, 10.5 and Gen11

- China Star's Gen 11 is the same size as BOE's Gen 10.5, with a 2940 × 3370 mm glass substrate.

Gen 10: Sharp vs. BOE vs. China Star



Source: IHS

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Sharp vs. BOE Gen 10.5

	Sharp Gen 10	BOE Gen 10.5	Gen 11
X Side (mm)	3130	3370	3440
Y Side (mm)	2880	2940	3100
Capacity	72K / M	90K /M	90K/M (Plan)
Tech.	VA	IPS/FFS	VA
MP Timing	Q3'09	Q1'18	Under Discussion
Technology	a-Si	a-Si	a-Si/Oxide+OLED
Economical Panel Cut	32", 40", 60", 70", 80"	43", 49", 65", 75", 61" (21:9), 70" (21:9)	45", 49", 65", 78", 88"

Economical cut per panel

Panel Size	Economical Cut	Glass Efficiency
43"	18	96%
49"	12	82%
65"	8	96%
75"	6	96%
61" (21:9)	10	93%
70" (21:9)	8	91%

Economical cut per panel

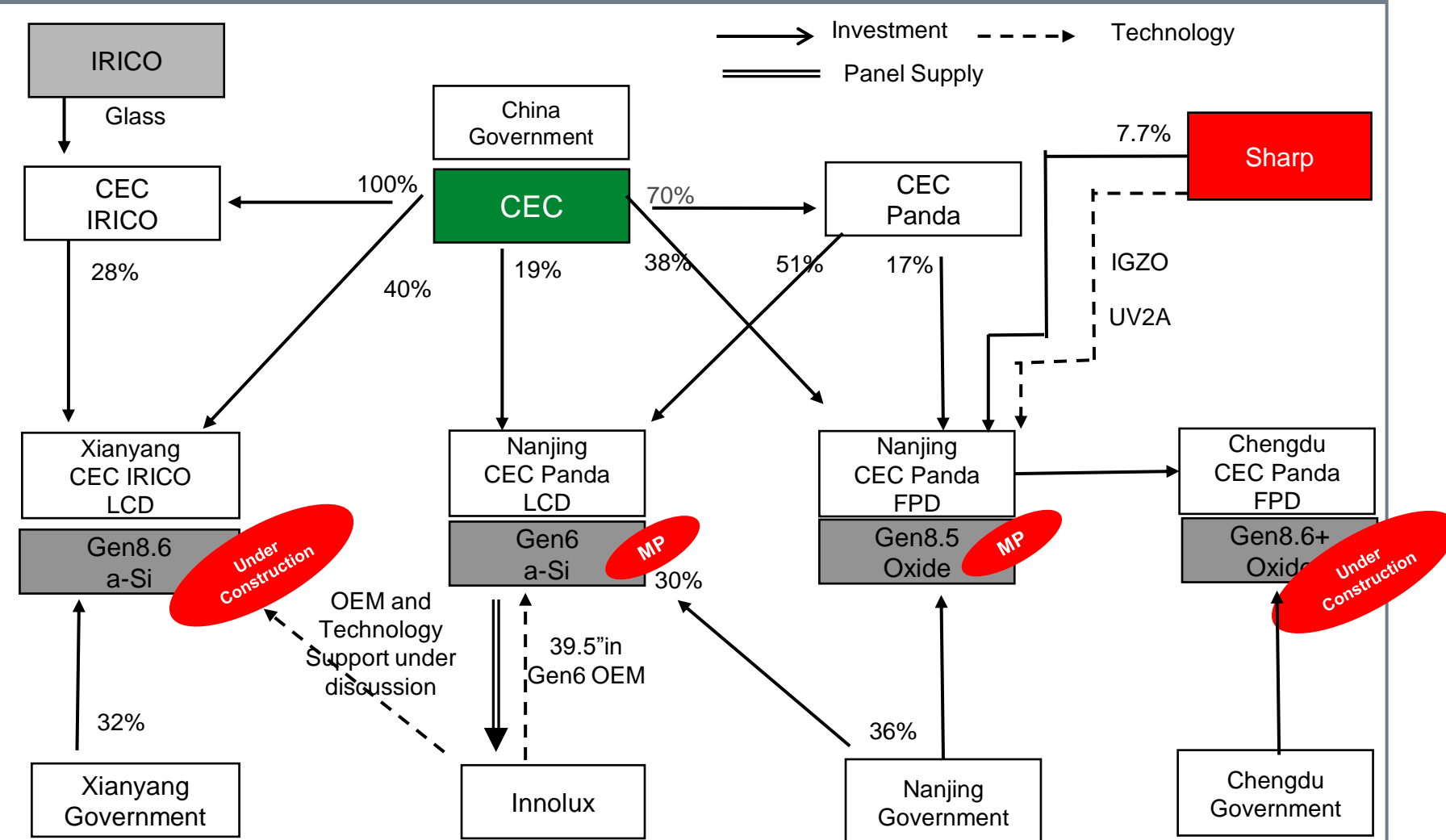
Panel Size	Economical Cut	Glass Efficiency
45"	18	97%
49"	15	95%
65"	8	89%
77"	6	96%
88"	3	62%

Source: IHS

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CEC (China Electronics Corp.)

CEC's Involvement in LCD



Source: IHS

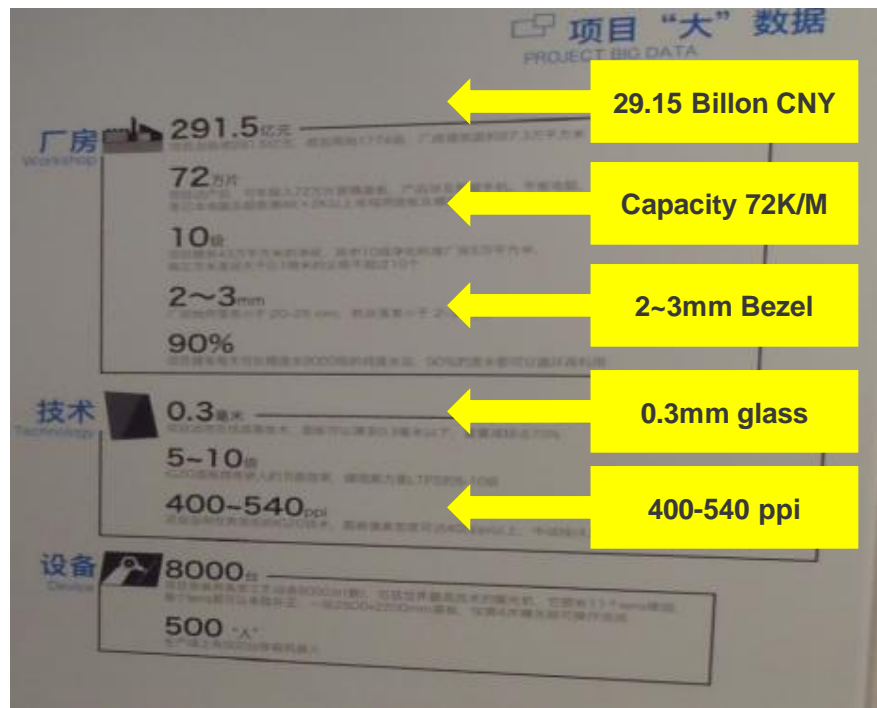
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CEC-Panda, Gen8 Oxide Fab

- Oxide Gen8 ramp up start in Q3'15.
- Target product: 11.6" FHD NB (190ppi) oxide, 13.3" FHD NB (166ppi) oxide, , 5.5" FHD (403 ppi) Smartphone, 55" UHD (81ppi).
- Four technologies transferred from Sharp.

- Struggle with MP until Q2'16. Small shipment only.
- (many) Issues: Specification issue (mechanic), IGZO yield rate and reliability, Driver IC is COF, not GOA, therefore no slim-bezel, Sharp engineering support, Copper process, and most bottleneck: optical alignment for IPS.

CEC-Panda Gen8 Oxide Plan



Source: IHS

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CEC-Panda Gen8 Fab Opening Ceremony



Source: IHS

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China Gen8.6 New Fab : Innolux's alliances?

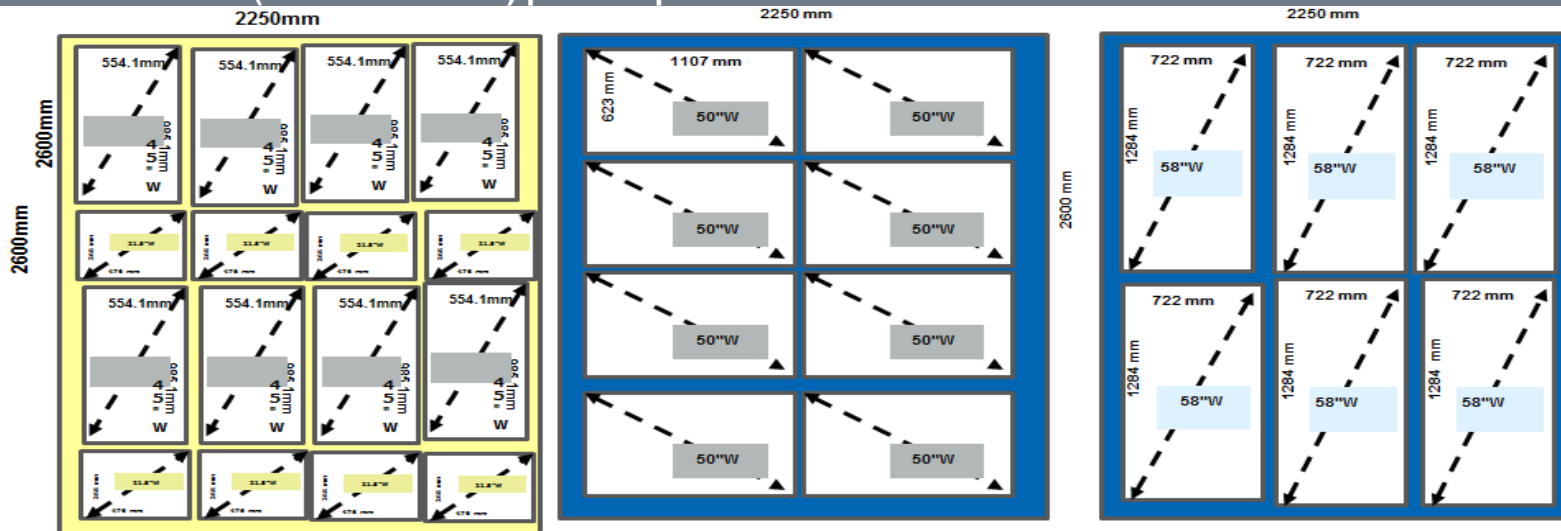
Economic Cut of Gen 8.6

Gen.	Glass Size	Economic Cut	Hybrid Cut	Panel makers
Gen8	2160x2460mm	32", 46", 60"		Sharp
Gen8 (8.5)	2250x2500mm	32", 48"/49", 55"	43"+21.5", 65"+32"	Samsung Display, LGD, BOE, CSOT, AUO, Innolux, Panasonic LCD , CEC-Panda Nanjing
Gen8 (8.6)	2250x2600mm	32", 50", 58"	45"+23.6"	Innolux (Taiwan) HKC (Chongqing, China) CEC-Irico (Xianyang, China)
Gen8 (8.6+)	2290x2620mm	50", 58"	68" + 58"	CEC-Panda (Chengdu, China) Oxide

Source: IHS

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Innolux's Gen 8.6 (2250 × 2600 mm) product plan

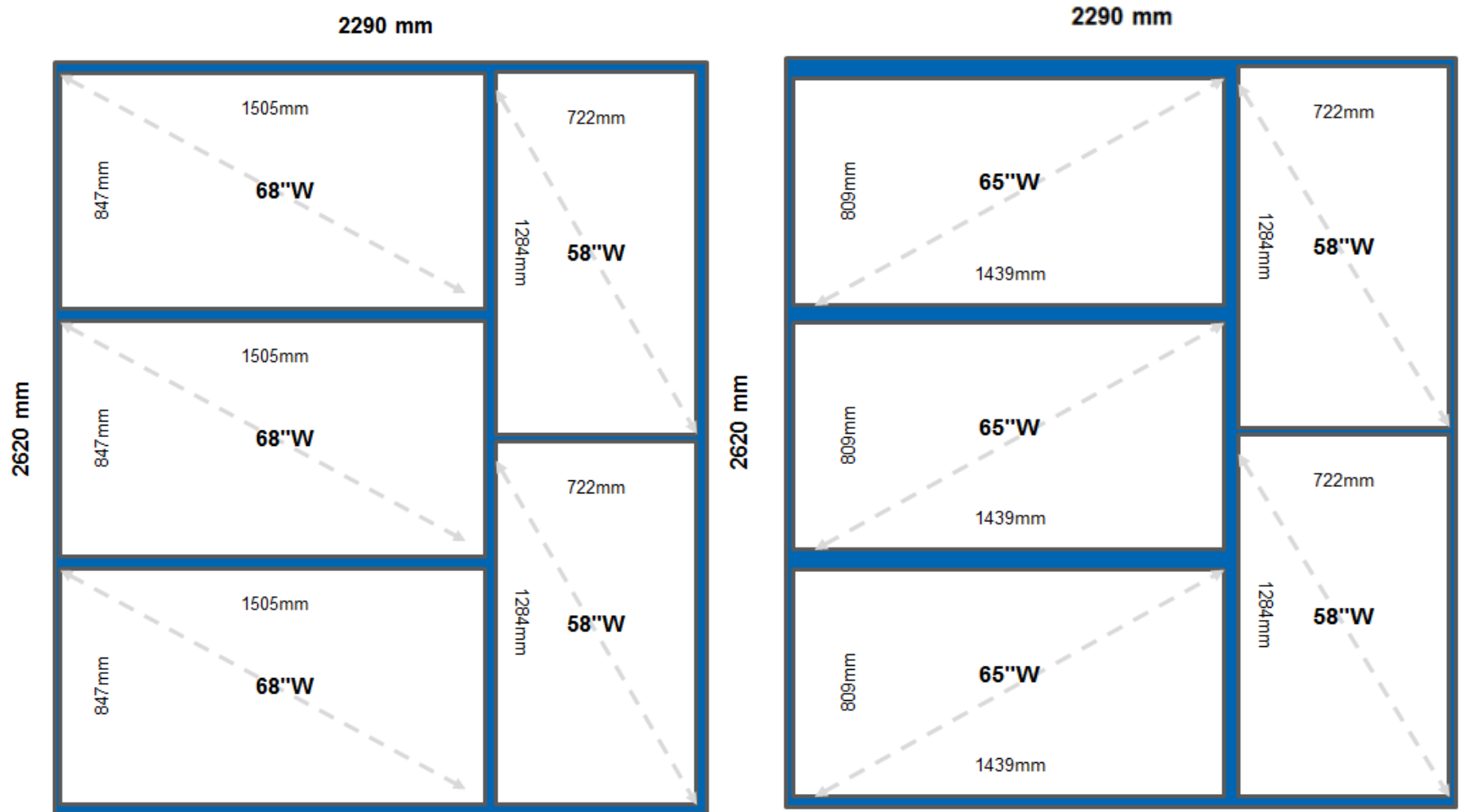


Source: IHS

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CEC-Panda Chengdu Gen8.6+ Oxide Fab: 68"+58" MMG

CEC-Panda Chengdu Gen 8.6+ (2290 × 2620 mm) product plan : Oxide + 8K Resolution



Source: IHS

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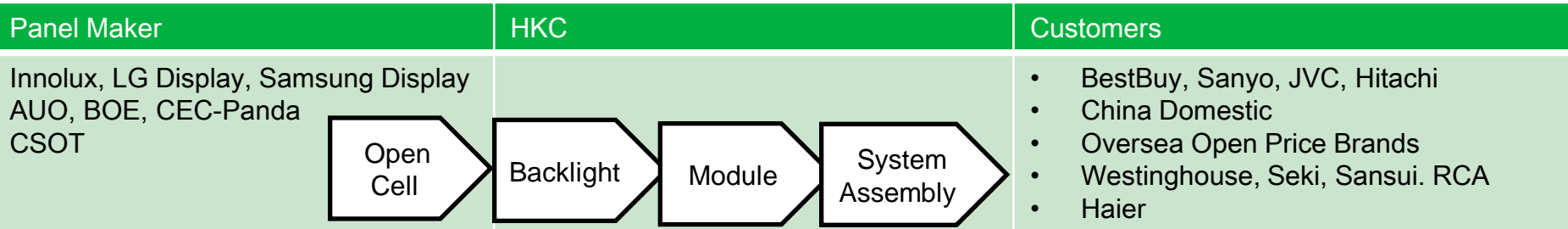
New Comer of Gen8 in China – HKC

- HKC and Chongqing Government joint venture totally RMB\$12B (US\$2B)
- Gen8.6 TFT LCD Fab in Chongqing (重慶市) in Sichuan (四川省).
- Construction started from Q3'15, MP aims at Q2'17. first product is 32", then 50". Firstly for HKC in-house OEM. 70K/M Glass Input.



- A 2nd tier China local LCD Monitor and LCD TV OEM/ODM/Brand Maker.
- For China domestic market and global market. Own brand "HKC" in China.
- OEM for Europe, North America, South Asia small brands. OEM for Tongfang.
- Makes own BMS (Backlight, Module, System)

Product	Size	2013	2014	2015	2016
TV	18"-65"	3.5M	5M	10M	15M
MNT	<32"	4M	7M	15M	15M



HKC Gen8.6 (or called 8.5+)Fab Lifting beam ceremony “重庆惠科金渝光电第8.6代薄膜晶体管液晶显示器工场”

HKC Gen8.6 Fab beam Lifting



Source: IHS, HKC

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China Small Medium and OLED Investment



China Makers are passionate about OLED/Flexible

- China makers are in small rigid AMOLED shipment but reliability is not stable.
- The government subsidy is shifting the focus from LCD to AMOLED.
- BOE and CSOT invest in Kateeva, soluble printing OLED equipment developer.

EverDisplay Flexible 5.6" QHD



Source: IHS

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Tianma Bendable 5.5" FHD



Source: IHS

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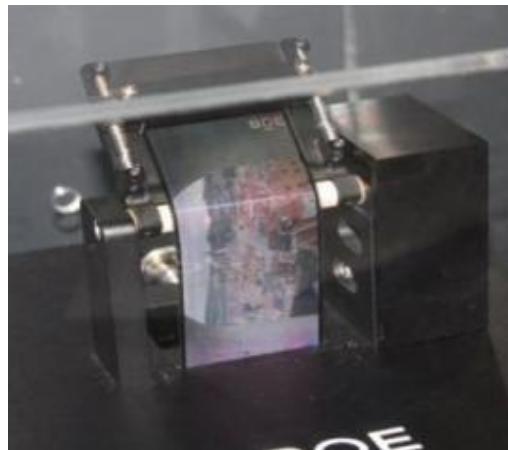
GVO (Visionox) 4.6" 200 ppi Flexible



Source: IHS

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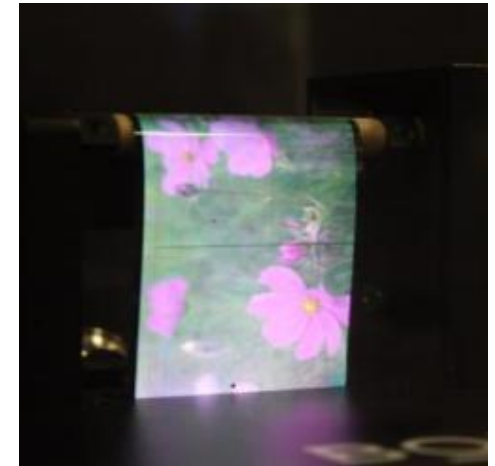
BOE Bendable 4.35" WVGA



Source: IHS

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BOE Foldable 4.35" WVGA



Source: IHS

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BOE: The most aggressive panel maker

- Flexible AMOLED is the ultimate target of BOE small/medium display technology. BOE plans aggressive plan to invest flexible AMOLED capacity directly in their Chengdu B7 fab and books one Canon Tokki ½ Gen 6 evaporation equipment. Even though the equipment deliver will be delayed to Q1'17, BOE will still be the first one in China to own the lasted evaporation equipment .

Fab	Gen	Tech	Phase	Type	Eva. Capa	Q1'16	Q2'16	Q3'16	Q4'16	Q1'17	Q2'17	Q3'17	Q4'17	Q1'18	Q2'18	Q3'18	Q4'18
Beijing B1	Gen 5	a-Si LCD	1	Rigid	75K	MP											
Chengdu B1	Gen 4.5	a-Si LCD	1	Rigid	45K	MP											
Hefei B3	Gen 6	a-Si LCD	1	Rigid	90K	MP											
Ordos B6	Gen 5.5	LTPS LCD	1	Rigid	21K	MP											
		AMOLED	1	Rigid	4K	MP											
		LTPS LCD	2	Rigid	30K					MP							
Chengdu B7	Gen 6	AMOLED	1	Flexible	7.5K									MP			
			2	Flexible	16.5K												MP
			3	Flexible	24K												

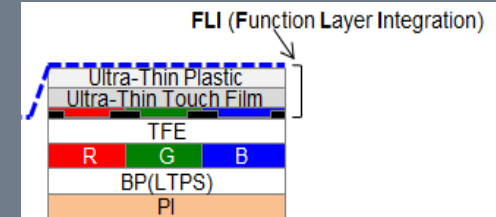
Enhance On-Cell and In-Cell
Expand to Automotive

* Ally with Synaptics for TDDI
(Touch Display Driver Integration)
* Move to On-Cell and In-Cell

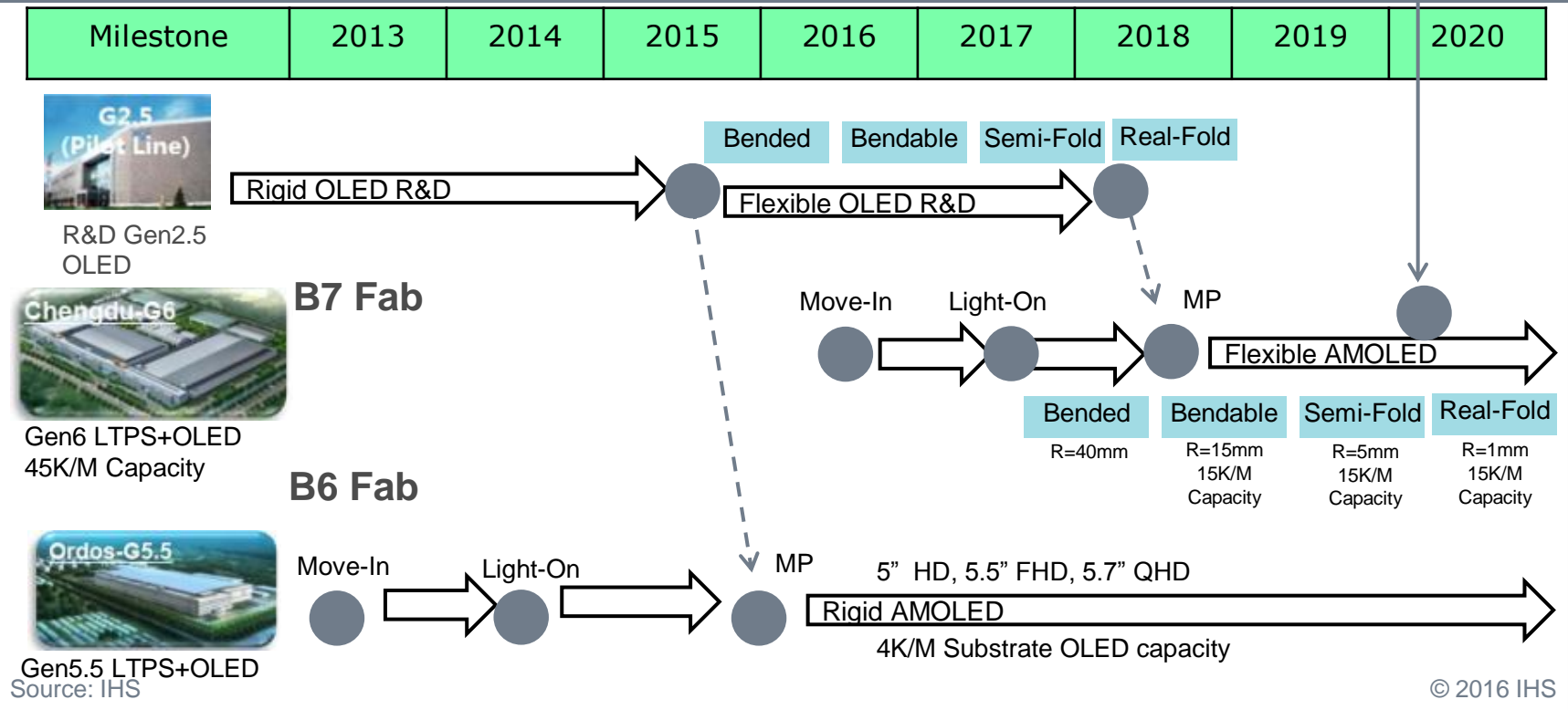
Canon-Tokki
Machine Move-In

BOE OLED and Flexible Plan

- BOE will have two fabs in OLED for smartphone : Gen5.5 (Rigid OLED) and Gen6 (Flexible OLED). The plan is to MP rigid OLED in early 2016, and then Flexible OLED in the middle of 2018.
- BOE plans to implement FLI (Function Layer Integration) to achieve the “foldable”. The FLI is to integrate the OLED polarizer + touch + cover plastic film.

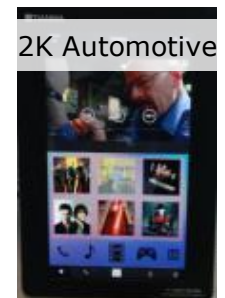
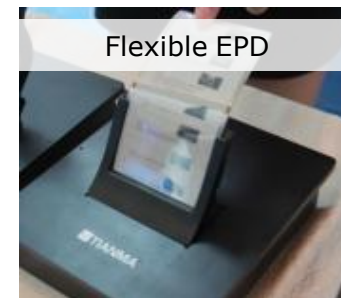


BOE OLED Plan



Tianma: Leading LTPS LCD but enhance AMOLED

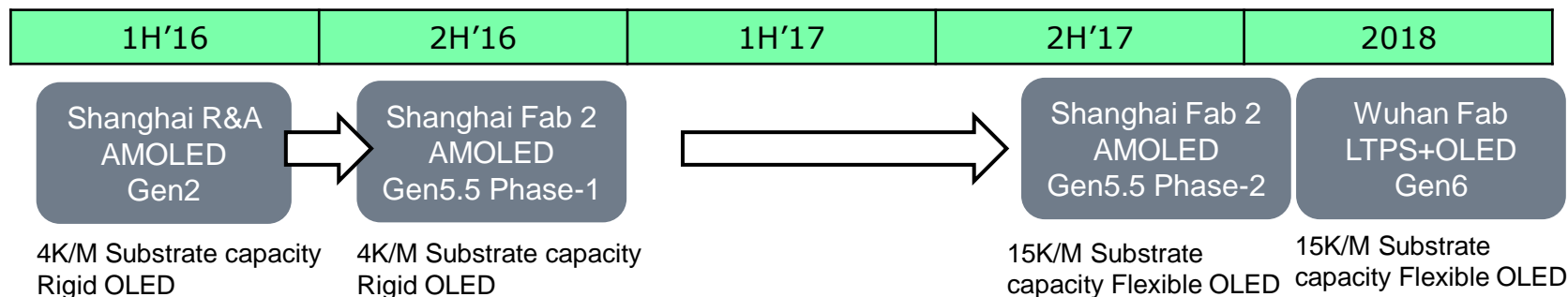
- Tianma has already leading China local LTPS LCD technology and now increase AMOLED investment steadily. Besides the ¼ cut of G5.5 evaporation capacity in Shanghai, Tianma officially announced to change their Wuhan (武漢) G6 LTPS LCD plan to G6 AMOLED plan directly.
- For LTPS LCD capacity, **TDDI full in-cell solution** will have high priority in 2017.
- Automotive and other industrial applications will continue to be important to make use of these G4.5 capacity.



Fab	Gen	Tech	Phase	Type	Eva. Capa	Q1'16	Q2'16	Q3'16	Q4'16	Q1'17	Q2'17	Q3'17	Q4'17	Q1'18	Q2'18	Q3'18	Q4'18
Shanghai aSi	Gen 4.5	a-Si LCD	1	Rigid	30K	MP											
SVA NEC	Gen 5	a-Si LCD	1	Rigid	81K	MP											
Chengdu aSi	Gen 4.5	a-Si LCD	1	Rigid	30K	MP											
Wuhan aSi	Gen 4.5	a-Si LCD	1	Rigid	30K	MP											
Xiamen 1	Gen 5.5	LTPS LCD	1	Rigid	30K	MP											
Shanghai OLED	1/4 G5.5	AMOLED	1	Rigid	15K		MP										
Xiamen 2	Gen 6	LTPS LCD	1	Rigid	15K			MP									
			2	Rigid	15K				MP								
Wuhan 2	Gen 6	AMOLED	1	Rigid/Flex	30K												

Tianma OLED Plan

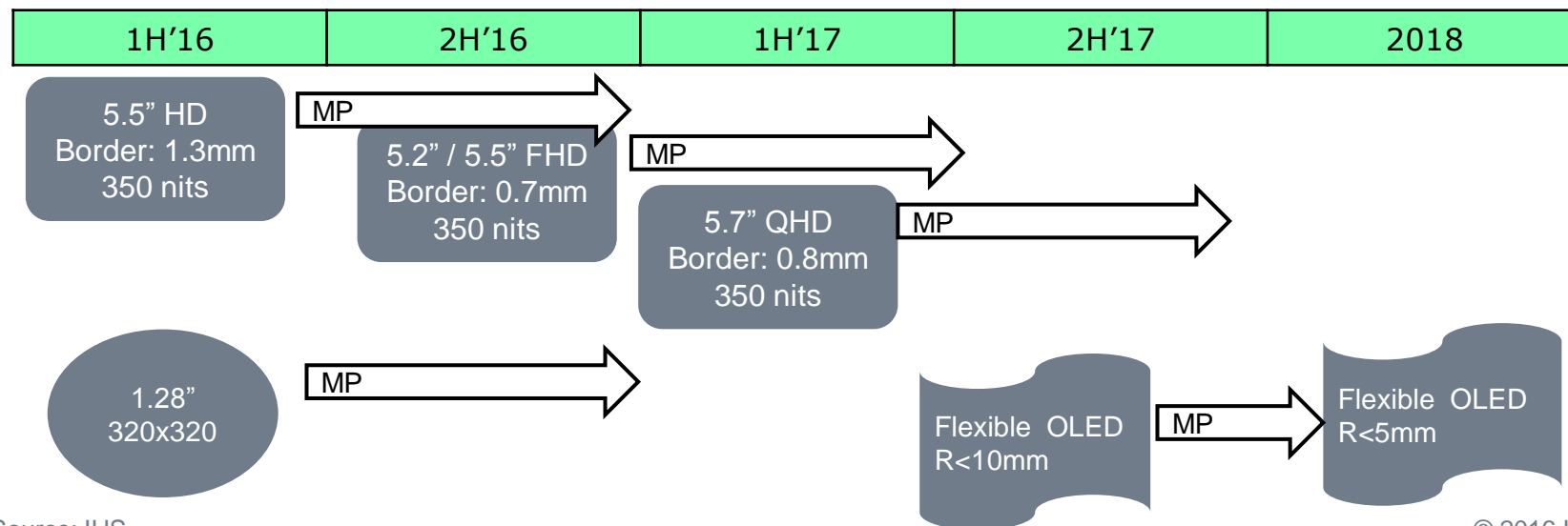
Tianma OLED Fabs



Source: IHS

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Tianma OLED Roadmap



Source: IHS

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Tianma AMOLED Panel in SID 2016

Tianma – Thinner rigid OLED display



- 5.5" HD TFE/OLED
- Thin-film encapsulation (TFE)
- Resolution: 720 × 1280
- Pixels per inch: 267
- Brightness: 350 nits
- Contrast ratio: 10,000:1

Source: Tianma – Photo by IHS at SID 2016 © 2016 IHS

Tianma – 5.5" flexible AMOLED display



- 5.5" flexible AMOLED
- Resolution: 720 × 1280
- Pixels per inch: 270
- Bending Radius: 20 mm

Source: Tianma – Photo by IHS at SID 2016 © 2016 IHS

Tianma – Narrow border OLED display



- 5.2" FHD
- narrow border OLED
- Resolution : 1080 × 1920
- Pixels per inch: 427
- Brightness : 350 nits
- Contrast ratio: 10,000:1
- Border width 1.2 mm



Source: Tianma – Photo by IHS at SID 2016

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Tianma – Automotive Display

Tianma – Automotive display



- 1.8" HUD
- Head Up Display
- Resolution: 480 × 240
- Transmission: 6.5%
- Contrast ratio: 1000:1

- 12.3" Curve + PCAP
(Projective Capacitor Touch)
- Resolution: 1920 × 720
- Brightness: 900 nits
- Contrast ratio: 1000:1

- 14.1" 2K1K SFT
(Super Fine TFT)
- Resolution: 2560 × 1440
- Brightness: 600 nits
- Contrast ratio: 1200:1

Source: Tianma – Photo by IHS at SID 2016

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Visionox (GVO) OLED Development



Visionox (GVO) OLED Development



Source: IHS, Visionox

© 2016 IHS

Visionox: From PMOLED to Gen6 AMOLED

- Visionox : traditional PMOLED supplier. Expand to AMOLED .
- GVO (GVO = Govisionox) Kunshan G5.5 AMOLED capacity is Visionox's first AMOLED MP plant.
- Black Cattle Foods is investing in GVO for Gen5.5 AMOLED Capacity expansion and Gen6 OLED fab. Capacity will be 30,000 Gen 6 substrates to produce both rigid and flexible AMOLED panels. The investment also includes the OLED module assembly factory.

Black Cattle Foods Logo

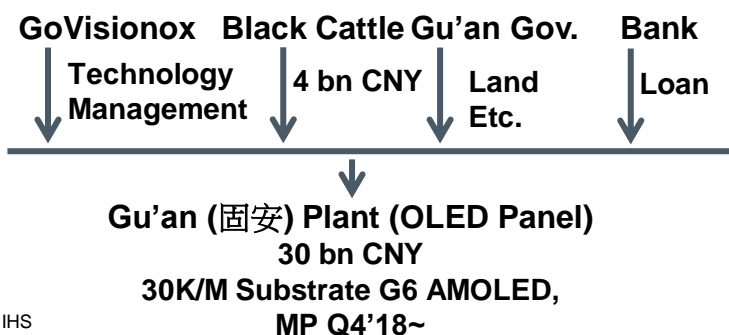


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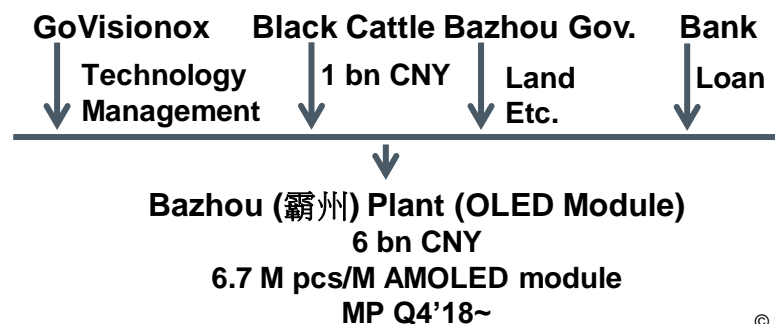
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Fab	Gen	Tech	Phase	Type	Eva. Capa	Q1'16	Q2'16	Q3'16	Q4'16	Q1'17	Q2'17	Q3'17	Q4'17	Q1'18	Q2'18	Q3'18	Q4'18
GVO Kunshan	Gen 5.5	AMOLED	1	Rigid	4K				MP								
			2	Rigid	11K					MP							
GVO Gu'an	Gen 6	AMOLED	1	Rigid/Flex	30K												MP

GoVisionox's New Gen 6 AMOLED investment plan in Hebei province



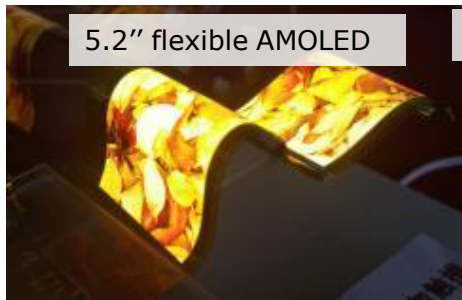
Source: IHS



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Truly: From module maker to panel maker

- Truly : traditional LCD module maker, touch module maker, fingerprint recognition module and CCM module maker. * after buying the old equipment from previous Samsung L4 and L5 plants, Truly has made big progress on LCD makers.
- Announcement of the first 5" 720HD a-Si LCD sample in Huizhou Gen 4.5 plant, In July'16, Truly disclosed their first AMOLED samples from the G4.5 AMOLED Gen4.5 plant.
- The focused sample of this demonstration was a 5.7"(5.68") FHD rigid AMOLED display, 388ppi. The RD sample will be ready for strategy client plan to MP by Q4'16.



5.2" flexible AMOLED



5.7" FHD AMOLED



Truly automotive displays



Truly Huizhou Plant

Fab	Gen	Tech	Phase	Type	Eva. Capa	Q1'16	Q2'16	Q3'16	Q4'16	Q1'17	Q2'17	Q3'17	Q4'17	Q1'18	Q2'18	Q3'18	Q4'18
Huizhou plant	Gen 4.5	a-Si LCD	1	Rigid	50K		MP										
	Gen 4.5	AMOLED	1	Rigid	15K			MP									
			2	Flexible	15K						MP						
	Gen 6	AMOLED		Rigid/Flex	TBD												
Shanwei plant	Gen 5	a-Si LCD	1	Rigid	50K									MP			
			2	Rigid	50K											MP	

EverDisplay AMOLED

- EverDisplay is focusing on AMOLED, without LTPS Cell equipment. But MP is not smooth due to the yield rate stability is not good. HTC orders in 2015 but lost from 2016. Recently EverDisplay is shipping smartphone OLED (FHD) to Coolpad.

EDO small/medium display fab production strategy

Fab	Generation (mm)	S/M %	Process tech.	Q4'15 Glass Capacity (K/M)	2016 Glass Capacity (K/M)	Product
Fab 1	Gen 4 (730 × 920)	100%	AMOLED	21K/M	15~18K/M (including touch)	Mobile Phone, Smart Watch VR, Automotive
Fab 2	Gen 6 (1500 × 1850)	100%	AMOLED	Investment from Shanghai government: 30K/M. MP in 2019		Rigid and Flexible , Mobile Phone, Smart Watch VR, Automotive

Source: IHS

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5.6" WQHD flexible AMOLED



Source: IHS

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6" UHD AMOLED



Source: IHS

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5.6" HD transparent AMOLED



Source: IHS

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Taiwan Makers Strategy



Taiwan Intends to Maintain Market Shares in 2017

- Thanks to new capacity added from AUO and Innolux in 2017, it helps to maintain Taiwan panel maker's market share in the worldwide. Meanwhile, Korean panel makers' defocus on TFT LCD panels also help Taiwan makers' market shares. Specially Taiwan panel makers are aggressive in TV and Notebook applications.

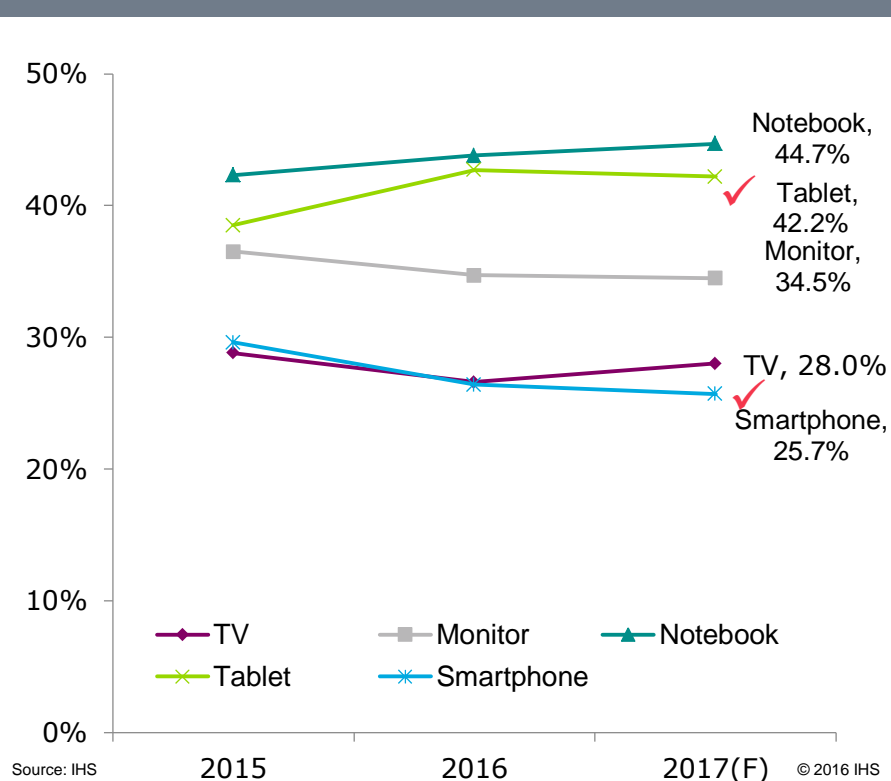
Taiwan panel maker's BP in 2016 and 2017(millions units)

Application	Suppliers	2016(E)	2017(F)	YoY
TV	AUO	27	29	7%
	Innolux	41	45	10%
Monitor	AUO	25	24	-4%
	Innolux	23	22	-4%
	HannStar	0.25	-	-
Notebook	AUO	34	37	8%
	Innolux	36	40	11%
	HannStar	0.45	-	-
Tablet	AUO	24	25	4%
	Innolux	16	16	-
	CPT	44	42	-5%
	HannStar	9	9	-
Smart phone	AUO	95	110	15%
	Innolux	123	130	6%
	CPT	100	100	-
	HannStar	110	110	-

Remark: Business Plan(BP) is changed time by time.
Source: IHS

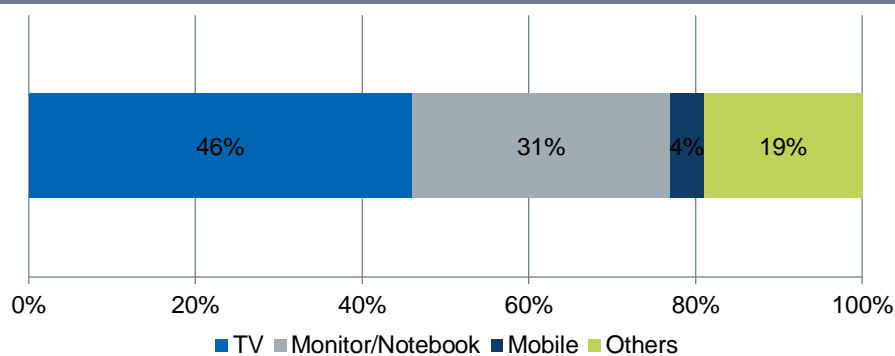
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Taiwan panel maker's market share in the worldwide



AUO concentrating on high-end specification

AUO revenue breakdown by application (Q2 2016)



Source: IHS

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AUO key product highlights

Application	Product	highlight
LCD TV	Super-large size	75" and 85" MP in Q3'16
	UHD and 8K	Adopt for 50-inch and above
	Curved	Targeting 30% worldwide share in 2016. AUO's curved TV panel size covers 43-85"
	Bezel-less	AUO bezel-less TV panel only 5 mm non-AA display area. GOA process for UHD panel. Already in MP in Q1'16, targeted to be 30% of AUO's total UHD panel shipments in 2016
NB	LTPS NB	MP scheduled for Q3'16 with 13.3" UHD first
Mobile	LTPS, FHD above resolution	4K(806 ppi) mobile panel is ready
Automotive	Total solution	AUO plans to grow 15-20% Y/Y
OLED	Wearable	Focused on 1.2-1.6"
	Virtual Reality	AUO offers 3.8" (420 ppi) and 5.5" FHD products now. They plan to offer over 600 ppi products later.

Source: IHS

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Products exhibited by AUO at trade shows



65/75" bezel-less, UHD, 4000R curved TV



65" bezel-less 8K curved TV



25" curved display



13.3" ultra-slim (2 mm),
UHD, super narrow bezel
(1.5 mm) LTPS notebook



1.2/1.4" full-circle
AMOLED



35" WQHD, 200 Hz ultra-wide curved display,
world's highest curvature at 1800R

Source: AUO

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AUO TFT LCD Capacity Strategy

AUO glass input by fab status (000 sheets per month)

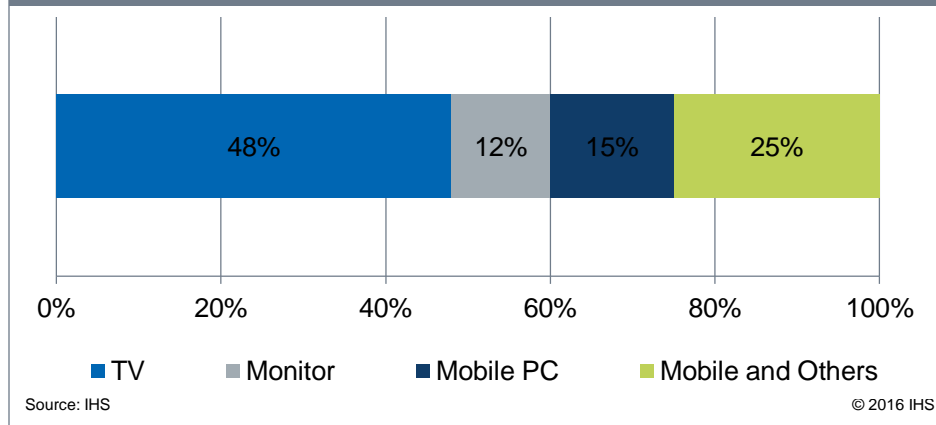
Line	Gen	Q3'16(E)	Q4'16(F)	Loading in Q4'16(F)	Applications	Remark
L3C	3.25	8	7		- E-paper	
L3D	3.25	2	2		- Wearable(OLED) (100%)	1.4" wearable OLED
L4A	3.5	29	27		90% Automotive(100%)	
L4B	4	29	30		85% Mobile/Wearable (100%)	LTPS Mobile
L5D	5	58	56		95% Mobile(60%)/Tablet and others(40%)	a-Si Mobile
Kunshan	6	Test	MP		- Mobile/NB	25K LTPS capacity. MP in Q4'16
L5A	5	60	60		85% NB (65%)/Monitor(15%)	
L5B	5	41	40		75% NB(70%)/Monitor(30%)	
L5C	5	115	113		80% Mobile(10%)/Tablet(25%) Monitor(10%)/NB(55%)	
L6A	6	132	130		90% Monitor(52%)/TV(48%)	
L6B	6	130	130		100% Monitor(5%)/TV(95%)	65" share 95%
L7A	7	88	88		95% TV(100%)	43" share 50%
L7B	7	75	75		85% Monitor(20%)/TV(80%)	50", 43"UHD, 75"/85"
L8A	8	48	48		100% TV(100%)	55" share 90%
L8B	8	61	61		80% TV(100%)	30K added from Q3'16

Source: IHS

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Innolux maintains to target middle-low end market

Innolux revenue breakdown by application (Q2 2016)



Innolux key product highlights

Application	Product	Highlight
LCD TV	Size differentiation	Maximizing capacity and economies of scale: 40", 45", 50", 58"
	High resolution	4K2K :40" above size 8K4K: 65" MP in Q2'16; 85" under planning
	OEM projects	40" FHD (from CEC) ; 45" FHD (from SDP)
	Inno-MDL	40", 45", 50" and 58"
Notebook	Entry model	TN/VA model are over 80% monthly
	WCG(wide color gamut)	From 94% to Adobe 100%
	Slim design	3.0-3.15 mm narrow bezel
Mobile	Entry products	Prepared full line for 5.x" segment
OLED	Wearable	Still in development. Plans to MP in 2017

Source: IHS

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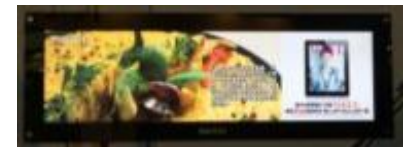
Products exhibited by Innolux at trade shows



75" UHD TV



85" 8K4K TV



29" strip PID



17.3" 4K Adobe
IPS NB



23.8" QHD WCG
monitor, 3 side
borderless



5.5" 1026 x 1560
rigid OLED



5.5" 1026 x 1560
flexible OLED



12.3" automotive
OLED

Source: IHS

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Innolux Finding The Best Solution in Each Fabs

Innolux glass input by fab status (000 sheets per month)

Line	Gen	Q3'16(E)	Q4'16(F)	Loading in Q4'16(F)	Applications	Remark
Fab1	3.25	44	41	75%	Automotive (60%) Others (40%)	Others included consumer electronic, Industry, e-paper, medical and so on.
Fab2	3.5	52	50	75%	Others (100%)	
T0	4	33	35	85%	Automotive (20%) Other (80%)	
T3	3.25	45	45	55%	Automotive (25%) Mobile (75%)	
T1	5	53	51	70%	Mobile (40%) Tablet (30%) NB (30%)	Focus on tablet later
Fab3	5	123	120	90%	Mobile (10%) NB (20%) Monitor (70%)	Considering adding automotive at the end of 2016
Fab5	5	168	165	75%	Automotive (5%) Mobile (25%) Monitor (10%) NB & Tablet (60%)	
Fab4	5.5	170	175	95%	NB (16%) Monitor (29%) TV (55%)	58" share-55%
Fab6	6	215	215	90%	TV (100%)	39.5" share-75%
T2	6	96	98	80%	Tablet (5%) Monitor (35%) TV (60%)	65" share-45%
Fab7	7	129	132	90%	TV (100%)	50" share-90%
Fab8	8	69	70	97%	TV (100%)	42"+23.6" share- 80%
Fab8b	8.6	-	-	-	TV (100%)	MP in Q1'17 – 45"/50"/58"

Source: IHS

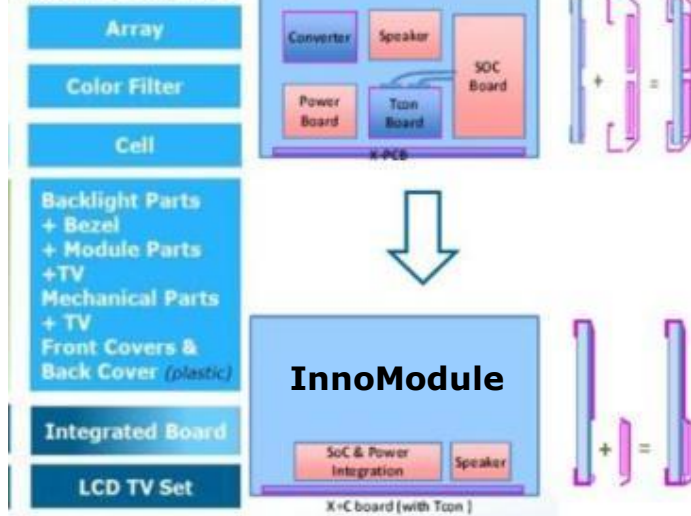
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Innolux's LCD TV InnoModule business model

- Innolux launched its Module+ concept, which integrates the module front bezel and rear plate to achieve a narrower bezel and thinner depth. It has been implemented with 40, 50, 58, 65-inch models.
- Advantages: Saves time, improves cost negotiations, and only one supplier is responsible.
- Disadvantage: Standardized, single source, value-add reduced

InnoModule concept

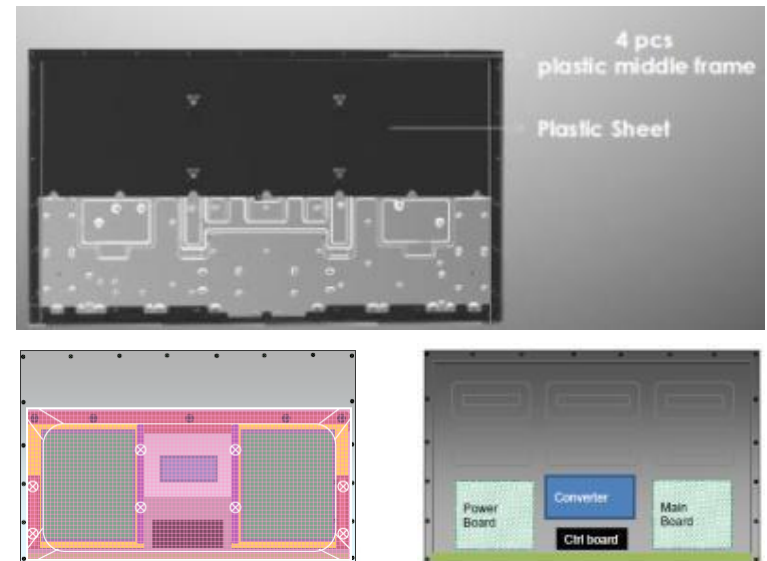
Module+ Concept Inno-module, LCM



Source: IHS

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InnoModule structure



Source: IHS

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CPT and HannStar fab status

- CPT utilization rate is expected to maintain as 95% averagely in both L1A and L2 in Q4'16, thanks to strong mobile panel demand.
- HannStar utilization remain high in Q3'16 and Q4'16 due to the shortage on a-Si mobile phone panel.

CPT and HannStar glass input by fab status (K/M)

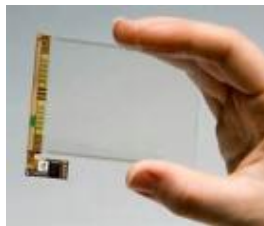
Panel maker	Line	Gen	Q3'16(E)	Q4'16(F)	UT in Q4'16(F)	Applications
CPT	L1A	4	72	71	95%	Touch(29%)/Mobile(40%)/Automotive(31%)
	L2	6	100	95	95%	Touch(20%)/Mobile(25%)/Tablet(35%)/Automotive(5%)/Others(10%)
HannStar	Fab1	5	101	95	95%	Automotive(5%)/Mobile(75%)/Notebook(5%)/Tablet(10%)/Others(5%)

Source: IHS

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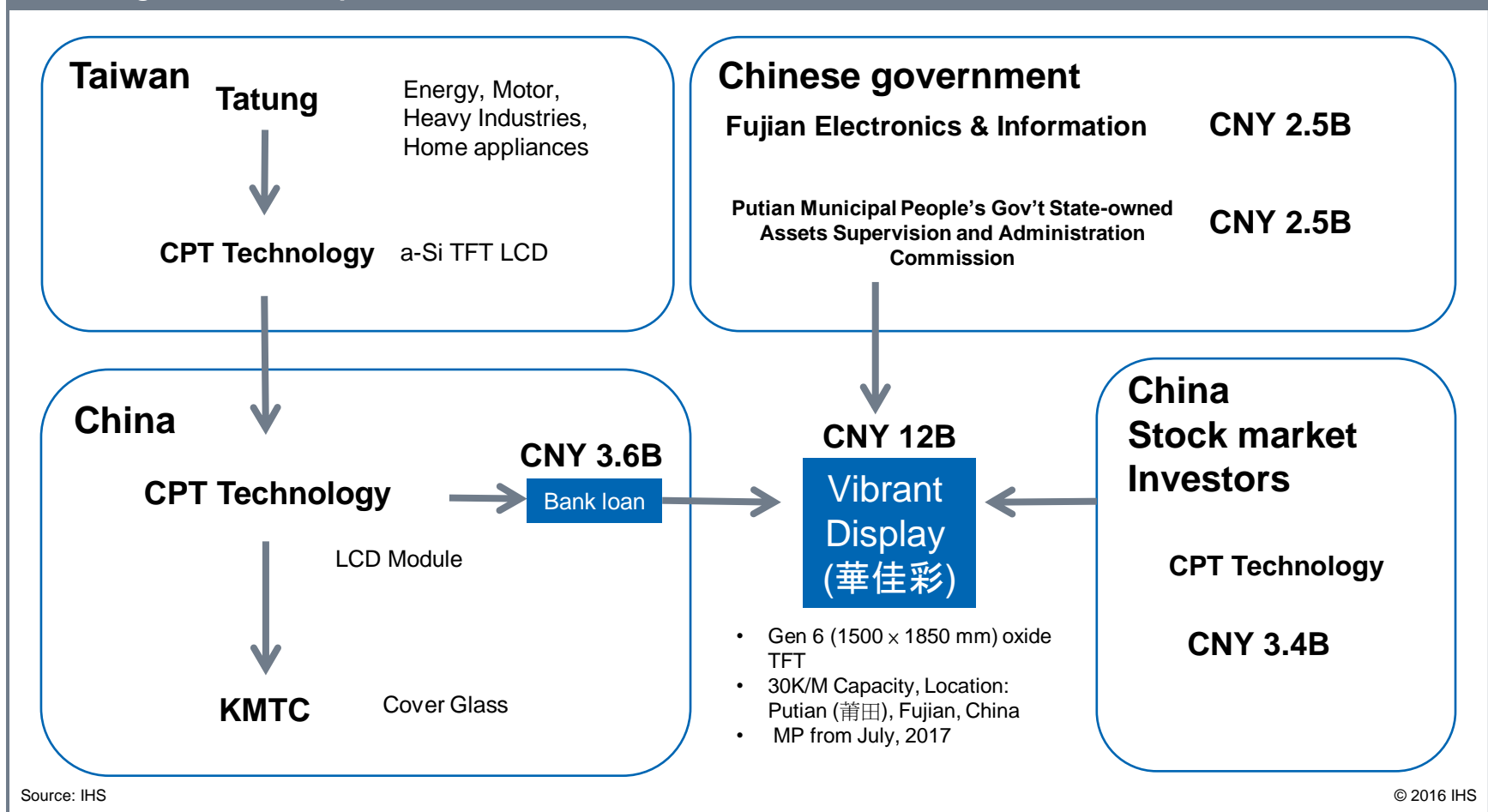


CPT Automotive display 12.3" and 12.1"



CPT Technology Oxide & OLED Investment

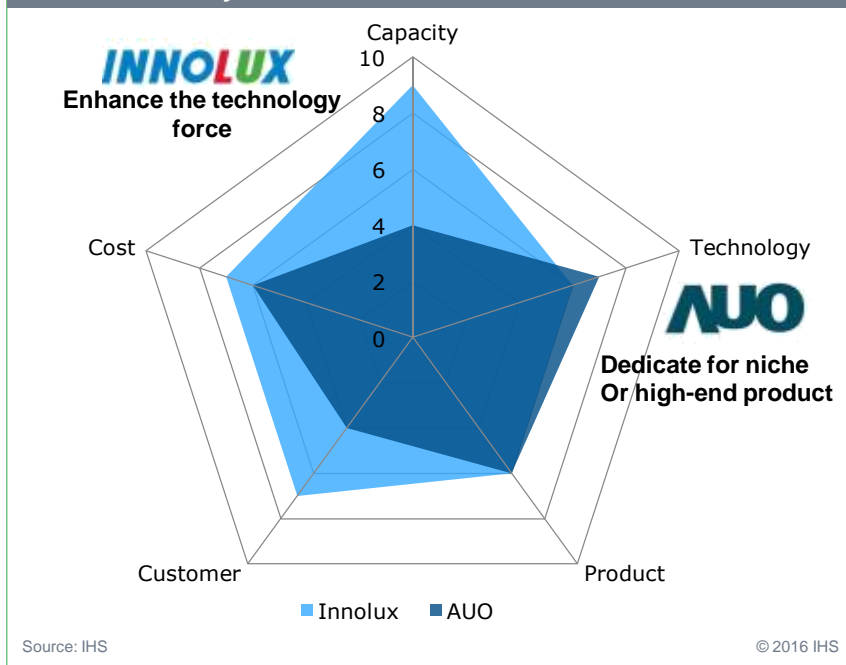
Chinese government helps fund CPT's investment in a Gen 6 oxide fab



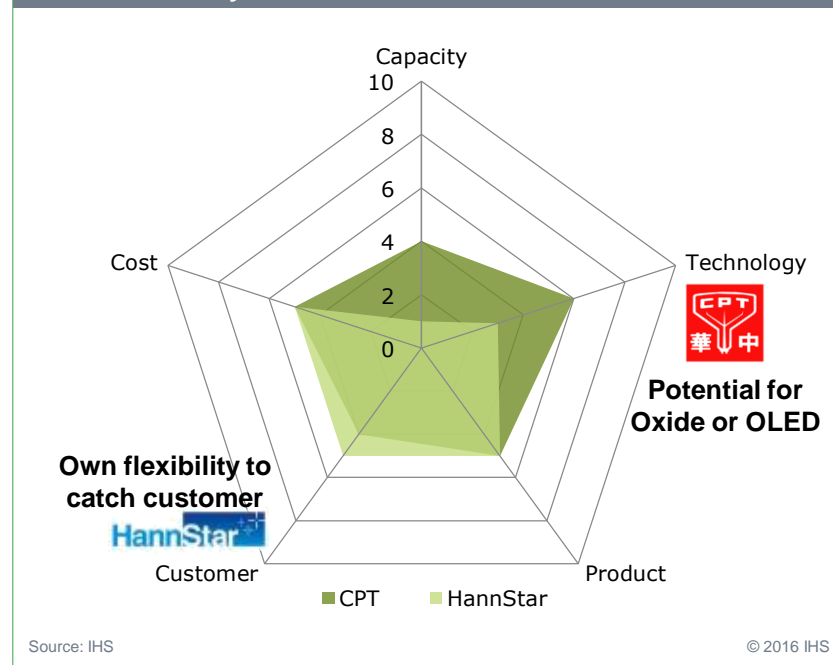
Overview: Taiwan maker's strategy evaluation

- AUO is limited by capacity and customer structure, it seems hard to expand display business scope. AUO needs to work in the niche and higher end market.
- “If” Combine with Sharp’s panel business, it enhances Innolux’s competitive incapacity, technology and product in the future.
- HannStar suffers only one G5 capacity with entry model products only. So they have to have flexibility to find customers in the niche.
- Excepted new G6 lines in China, CPT’s currently panel business is also gloomy in small and medium size display.

Five forces analysis for Innolux and AUO



Five forces analysis for CPT and HannStar



Thank you for your attentions

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