



Jasper Display Corp.

New Technology Platform



BLUE OCEAN STRATEGY

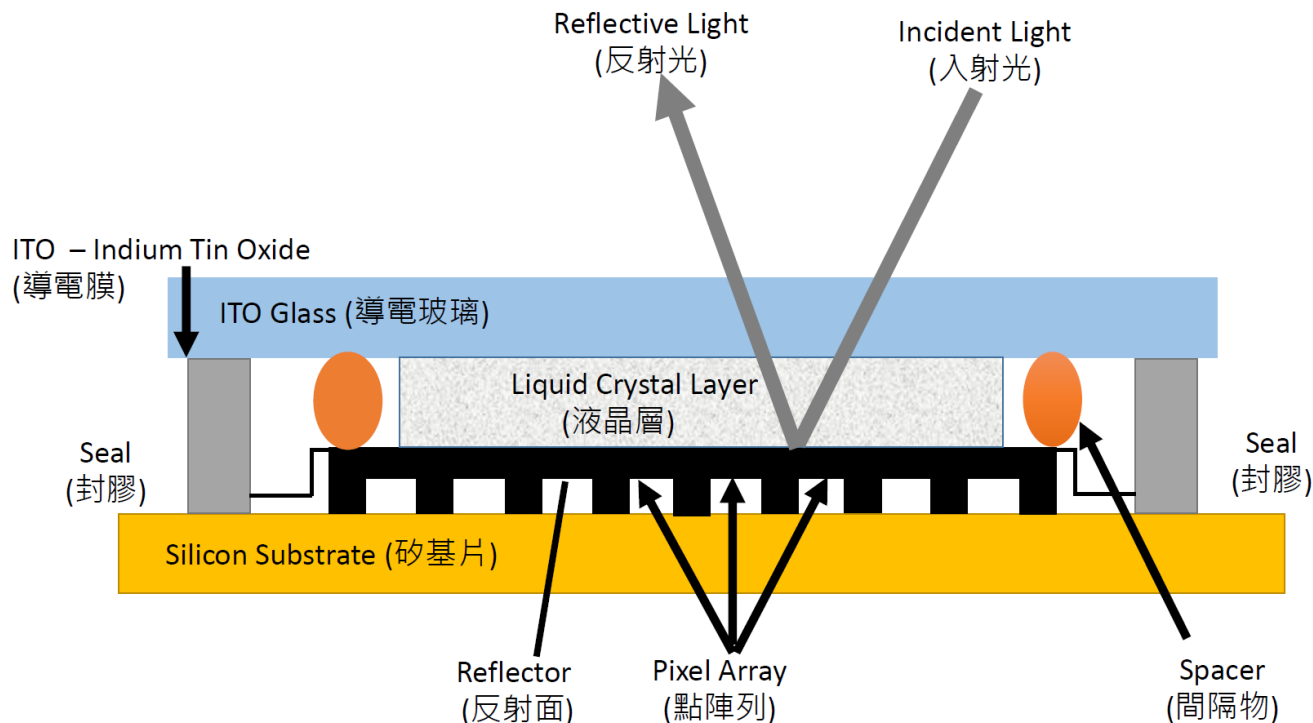
- **Optics & Materials** couple electronics, mechanics, productization and mass production abilities
- **LCoS (Liquid Crystal on Silicon)** as a core technology to develop
- **On-Silicon and On-Glass** dual technologies develop together
- **Technology-intensive and Capital-intensive** complement each other
- Integrate industries, governments, academia, research institutions and the **whole industrial chain** to create blue ocean opportunities together





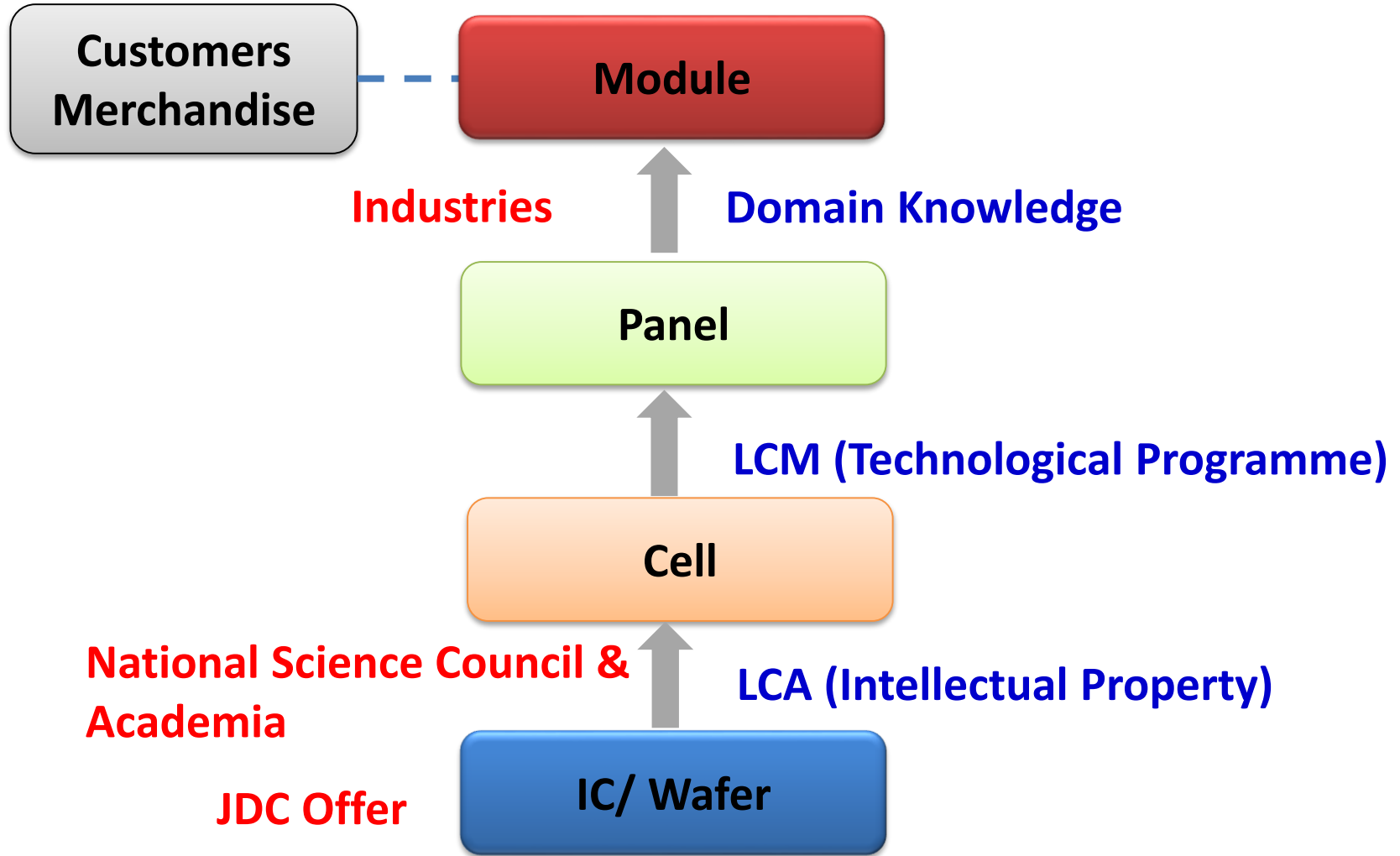
LCoS Introduction

- The backplane is a controlling reflective surface over a semiconductor substrate (similar to DRAM or SRAM designs done with CMOS circuits on silicon chips). After the substrate is polished and coated with a reflective film, it needs to be mated with a thin controllable layer material such as LC, LED, OLED, μ LED, FLC, and so on for different applications. When the material used is Liquid Crystal (LC), it is called LCoS (Liquid Crystal on silicon).





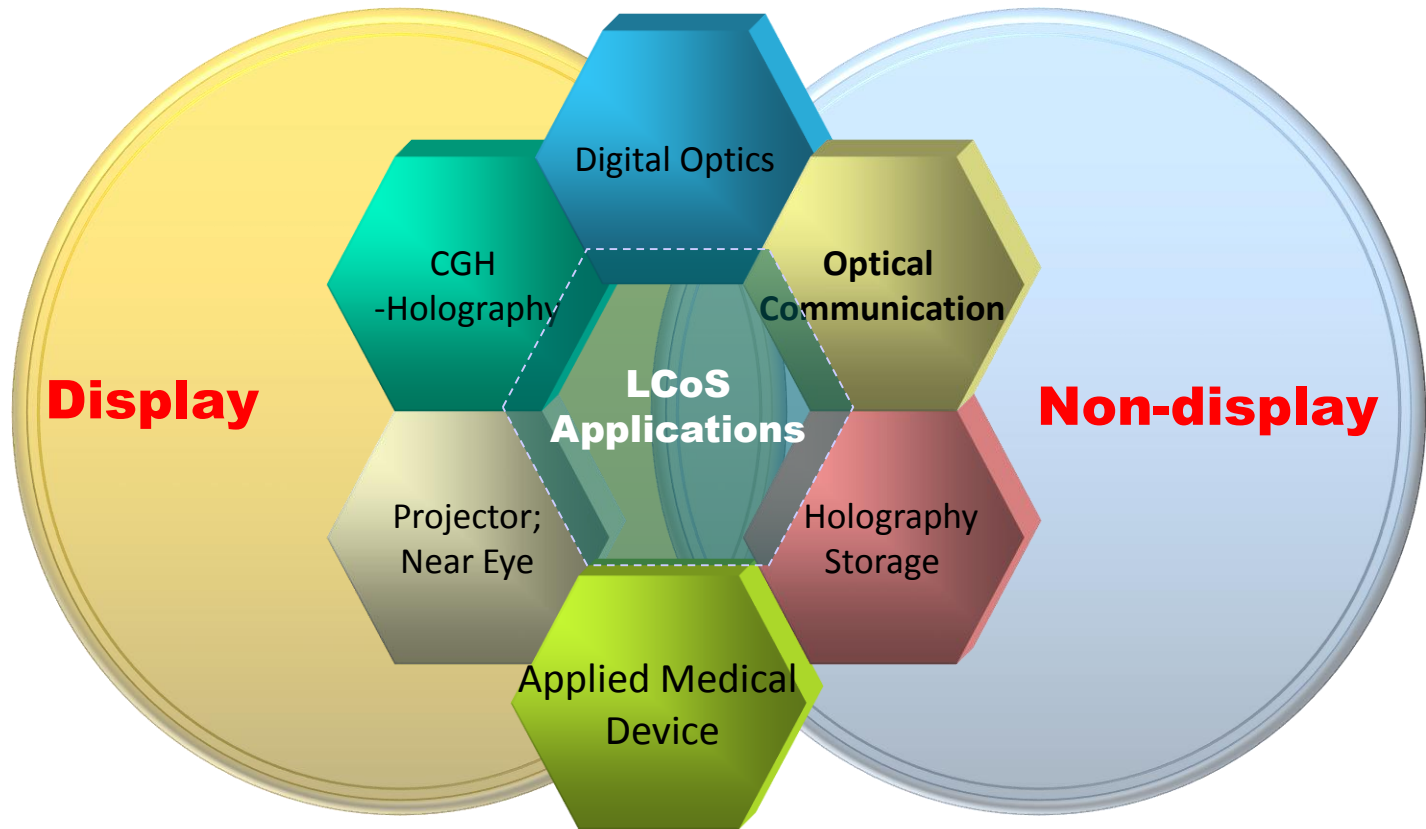
LCoS Industry Chain





LCoS Application

- LCOS technology through **Amplitude Modulation** or **Phase Modulation** applied for **Display** and **Non-display** application.



LCOS is Ready for Market NOW

Historical problems of LCOS (Past)	All Elements are ready now (Now)
<ol style="list-style-type: none">1. Low Panel assembly yield < 10%2. Engine manufacturing problems, like Uniformity, miss alignment, etc.3. Immature illumination or lamp issues, like High lamp cost, long warm up time, etc.4. In competition with Ambient Light	<ol style="list-style-type: none">1. High LCA/LCA yields - Overall yield > 70%2. Single panel engines are easier to manufacture3. New Era Light Sources are Ready<ol style="list-style-type: none">i. LED light sources are readyii. Laser light sources are achievable4. Special screens developed for front projection

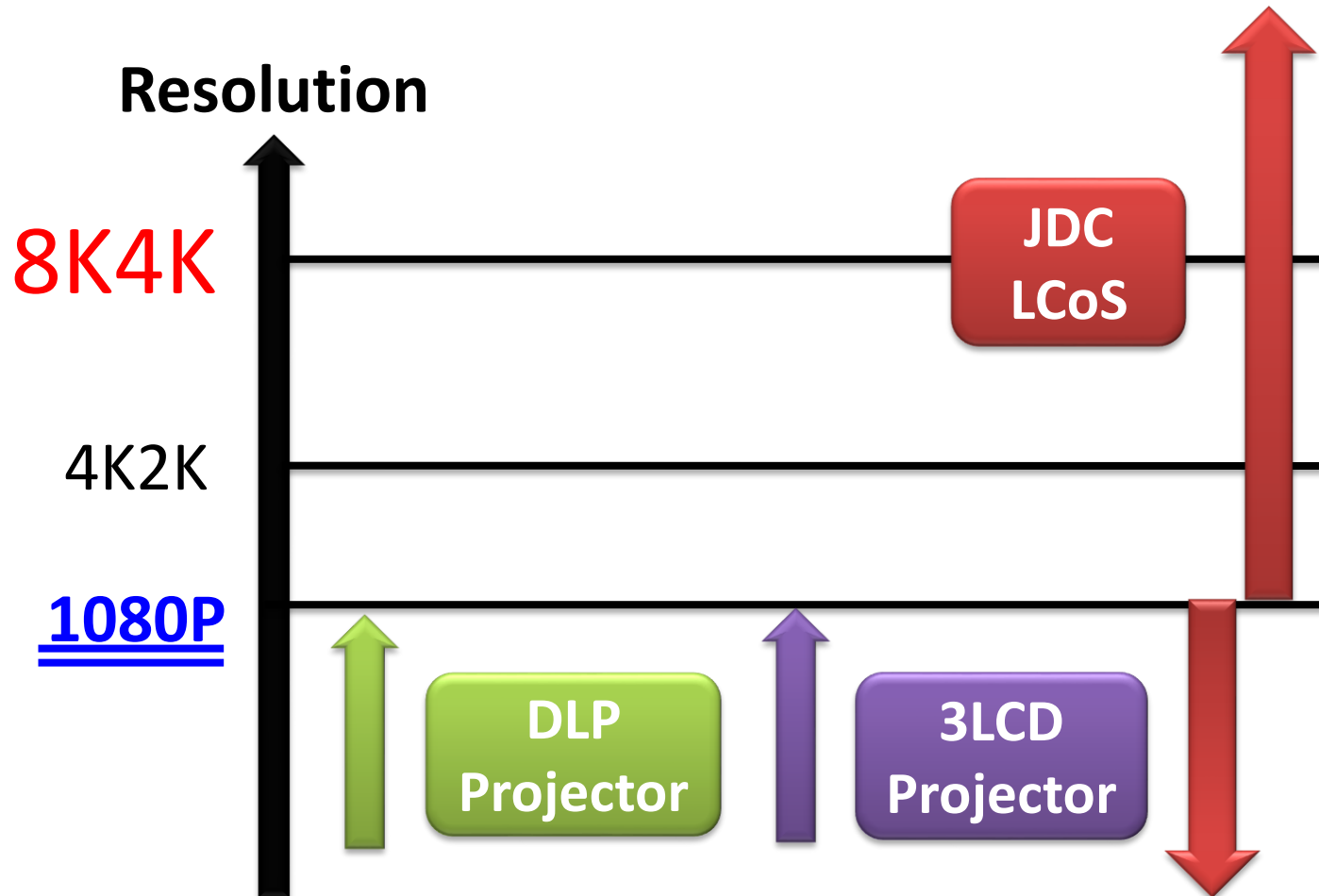


<http://careerbright.com/wp-content/uploads/2013/03/Success-steps.jpg>



LCoS Replacement Market - Resolution

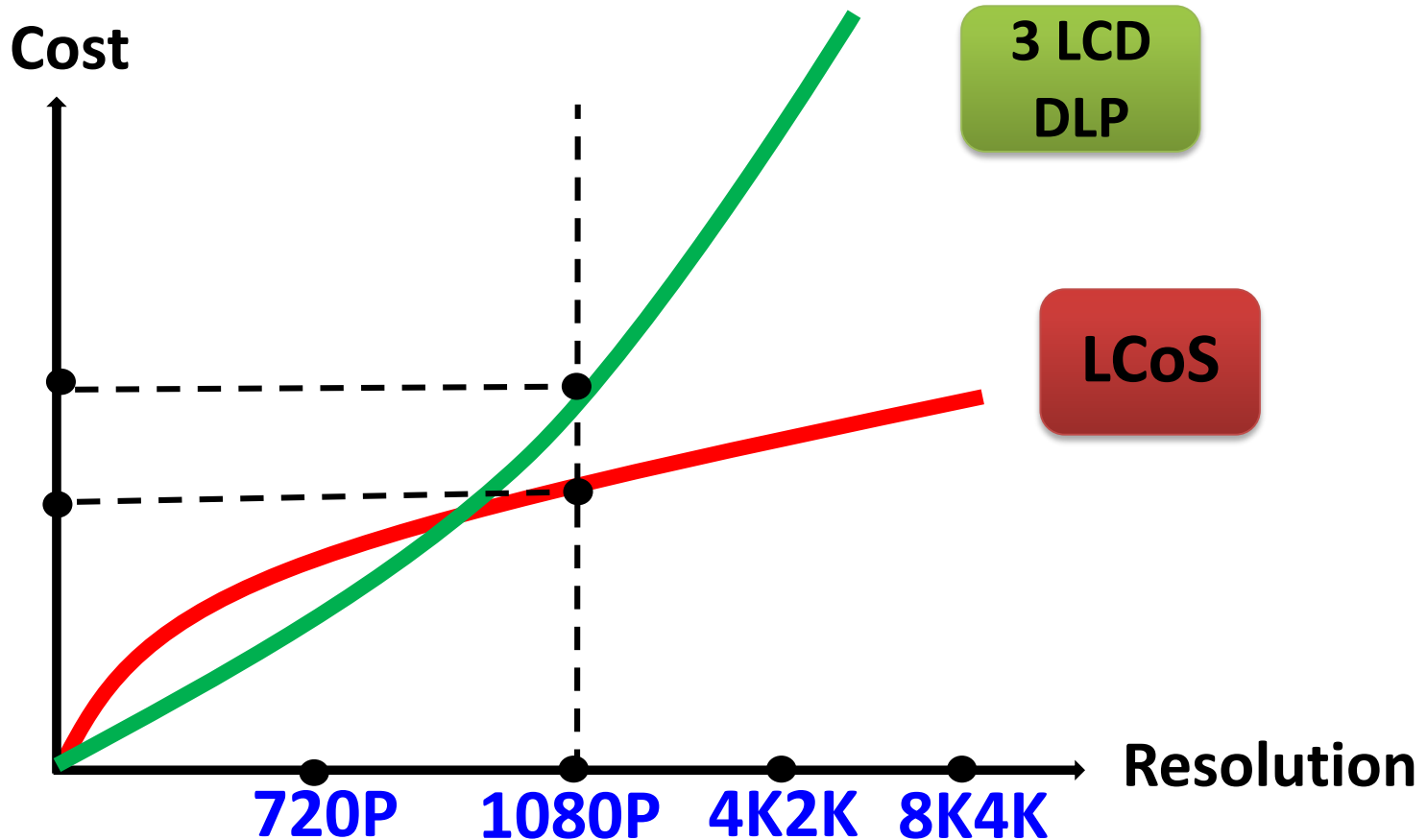
- LCoS technology is able to replace DLP and 3LCD technology controlled by TI and EPSON for projection applications.





LCoS Replacement Market - Cost

- Based on cost structure, when resolution reaches 1080p and higher, the cost of LCoS applications is less than the costs of 3LCD and DLP.





LCoS will come back to TV market in a big way

- **0.2"~1.4" Panel vs. 20"~150" LCD**
- High Resolution
- Large Screen size
- New screen technology
- Wireless multi-media (Video + audio) becoming available
- Short throw optical engines have become popular
- Green requirements
- True mobility & true box
- Target customer is "single" status or second TV at home
- Technology focus
- Easy Logistics, Handling, and installation
- Better cost performance



<http://images.getprice.com.au/products/BimgKALED46XX1AC.jpg>
http://www.e-velocity.org/wp-content/uploads/2012/04/Green-Solution_B.jpg



Projectors & TV Market

Technology	Panel Cost	Design Contribution (Controllable Cost)
LCD TV	80%	20%
LCoS TV	20%	80%

0.2"~1.4" Panel vs. 20"~150" LCD

TV Screen Size	Expected Market Share
50" and larger	30 ~ 70%
20" ~ 50"	5 ~ 15%
20" and less	50 ~ 90%

JDC Capability:

- Now: chip form .35" to 1.4"; pixel (resolution) from 2M to 8M
- Next Generation: chip is .25"; pixel (resolution) reach 2M



Cinema Market

Theater Size	Resolution & Panels
Home Theater for 5 People	2K x 1K, 0.55"~0.7" 1 panel and 3 panels
Home Theater for 10-20 people	4K x 2K, 0.7" or bigger size 1, 2 or 3 panels
Party Cinema for 20-30 ; 30-50 people	4K x 2K, 8K x 4K 3panels
General Cinema Today for 100-200 people	4K x 2K, 8K x 4K 3panels



<http://www.digitaltrends.com/home-theater/cine-beta-kipnis-studio-standard-6-million-kss-home-theater/>



LCoS – Innovation Market

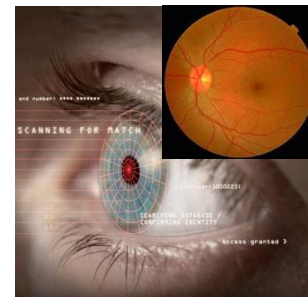
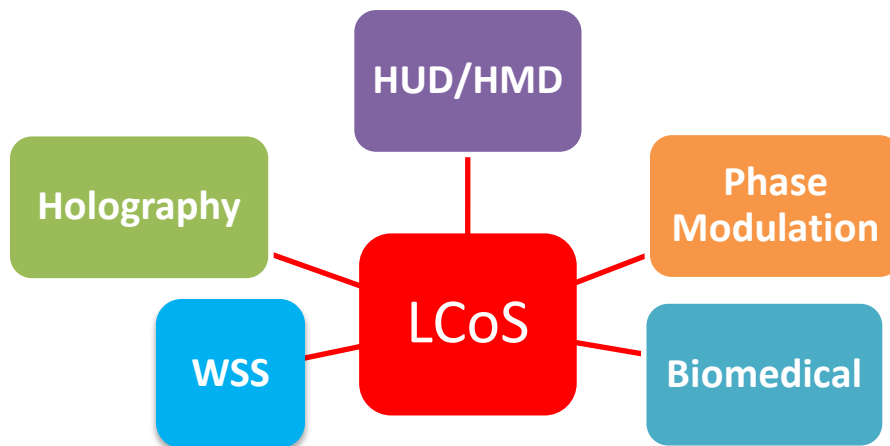
- Display: HMD (head mounted display), HUD (head up display), etc.
- Non-Display: SLM(Spatial Light Modulator) , WSS (Wavelength Selective Switch), etc.



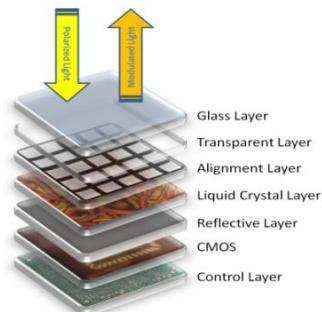
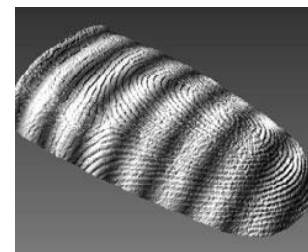
<http://itechfuture.com/virtual-holographic-display-zspace/>



<http://newlaunches.com/wp-content/uploads/2013/07/sony-head-mounted-endoscopic-display-1-590x412.jpg>



<http://webdesignlists.com/wp-content/uploads/2012/09/retinal-scan.jpg>
http://upload.wikimedia.org/wikipedia/commons/4/48/Fundus_photograph_of_normal_left_eye.jpg



MEMS Applications





LCoS & MEMS

- LCoS Comparison of IP, features, and parameters

Item	LCOS Performance	MEMS Performance
Phase Modulation Efficiency	★★★★	NA
Amplitude Modulation	★★★★	★★★★
Phase Modulation	★★★★★	NA
Low Cost	★★★★★	★
Brightness	★★	★★★★
LCA/LCM Yield Improved	★★★★	★★
High Resolution	★★★★	★★
Low Power	★★★★	★★
Programmability	★★★★	★★
Crosstalk	★★★★	★★
Fill Factor	★★★★	★★★
Small Size	★★★★	★★★



LCoS Promotion Proposal

- Establishing platforms to connect industry and academia with core technology – LCoS:

Mini-FAB

- Assisting the establishment of Labs with LCA or LCM capability for producing different chips for different applications
- Provide LCA or LCM service

ToSA

(Things on Silicon Alliance)

- Acquiring governmental recognition and support
- Assisting Industrial upgrades and enhancements
- Encouraging IP development and fostering talent
- Conducting seminars and conferences



Mini FAB Platform for Education

- Mini FAB is the bridge
- Cooperate with academia and research institutions
- Collaboration with academic institutions to encourage them to develop IP and to foster talent.

Supplier

Chemistry,
Material, Machinery,
Automation,
Industrial Engineering,
Electrical Engineering,
Nano-micro
Electromechanical,
Lab with clean room

Service Center

Mini FAB
LCA / LCM



Micro
Display

Application

Electrical Engineering,
Chemical Engineering,
Advanced Light Source,
Biotechnology,
Biomedical,
Telecommunications,
Micro-system,
Display technology,
Optical
Communications,
Optical MEMS,
Visual Communication



Mini FAB Platform for Industry Chain

- Mini FAB is the bridge
- Cooperate with academia, research institutions, and industries to develop together

Supplier

LC material
LED light source
Laser light source
LC sealing factory
Special surface plate
Equipment supplier
Optical parts
supplier and etc.

Service Center

Mini FAB
LCA / LCM

Micro
Display



Application

HMD/HUD

Short throw
projector

3D measurement

Machine vision

Laser Application

Biomedical

Optical
Communications

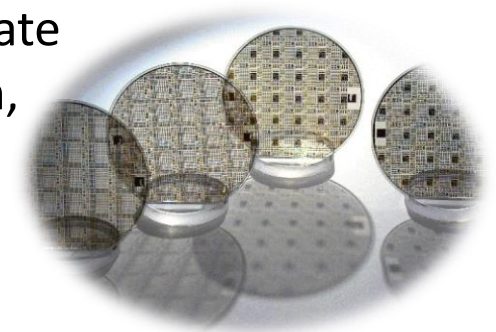


ToSA Introduction

- **The ToSA Name:**

“Things on Silicon Alliance” (ToSA) because the substrate supports multiple technologies: every-Thing on Silicon, and includes related technologies and applications.

- ToSA ◦



- **The ToSA Mission:**

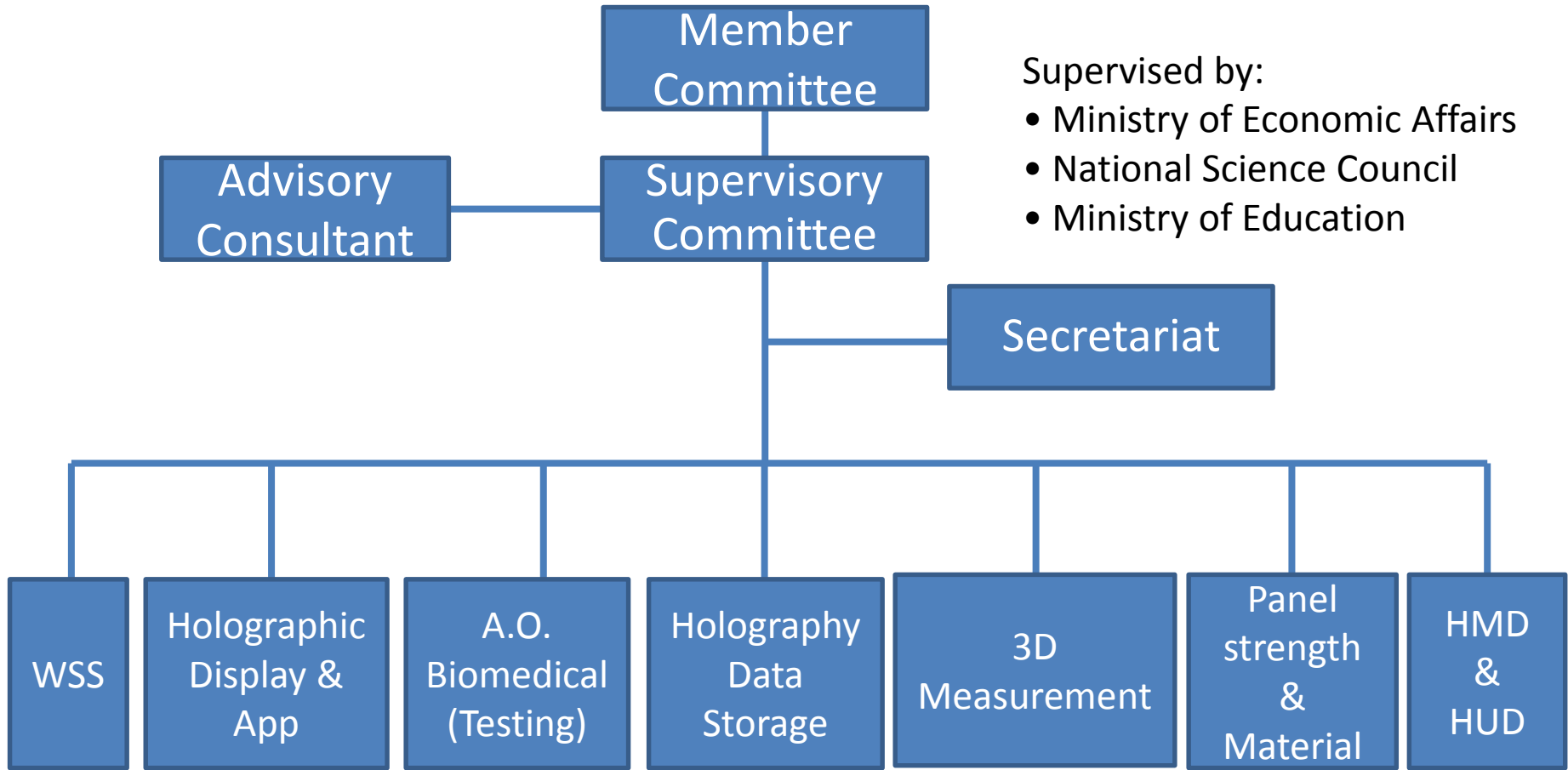
Cooperate with industries, government, academia, and research institutions, both domestic and foreign, to create blue ocean opportunities together.



http://images.tinydeal.com/others/site_cooperation.jpg



ToSA Structure



Sponsored by: Domestic & foreign enterprises



Winning Strategy

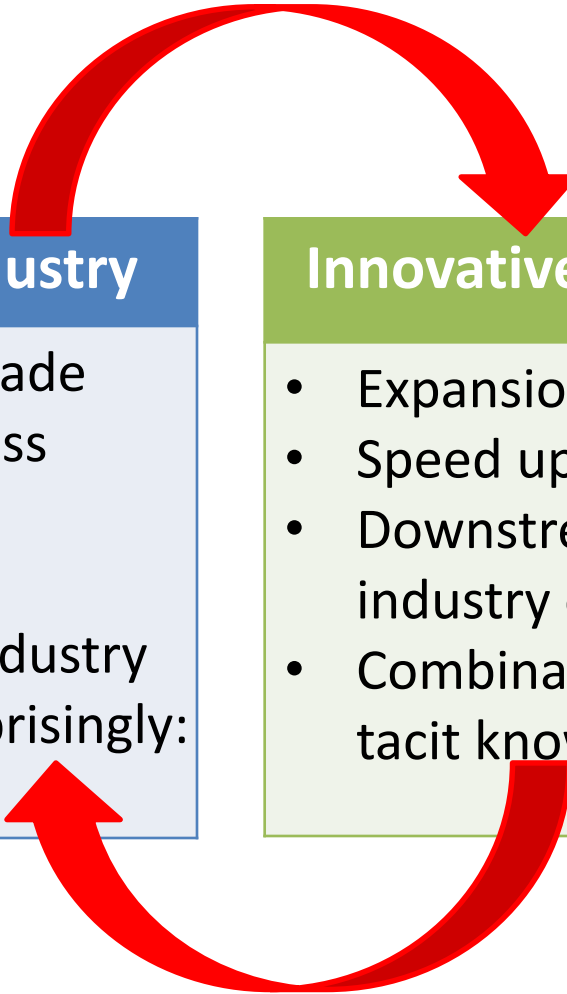
The Mini-FAB and ToSA platforms transform *innovating* into *value-creating*

Innovative Value of Industry

- Market feedback to upgrade industries competitiveness
- Extend creative resource
- Insights for future
- The key of sustainable industry (Innovate or Die?) – Surprisingly: to win

Innovative Value of Academic

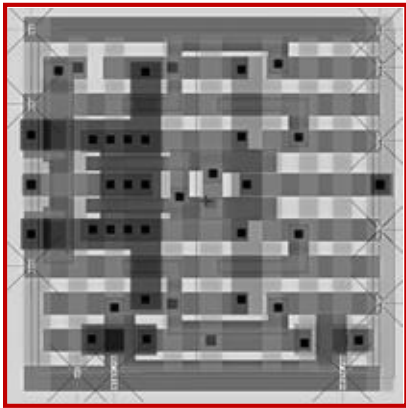
- Expansion of R&D resource
- Speed up for R&D
- Downstream knowledge for the industry chain
- Combination of explicit and tacit knowledge



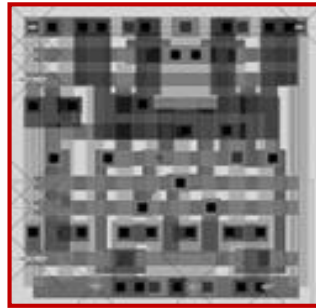


LCoS Development Progress

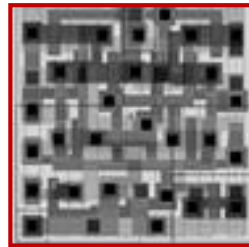
On-Silicon Technology: Pixel as a Platform



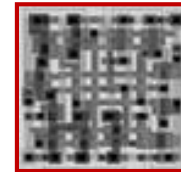
12 um @2002



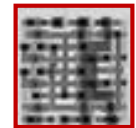
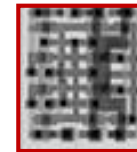
8.0 um @2004;
@2012-2H



6.4 um @2006;
@2011-1H



5.0 um & 4.0 um
@2007



3.74 um
@2013-1H

Based on 3.74 um pixel size, we could do:

- Microdisplay with 0.70" diagonal to achieve 4Kx2K resolution
- Microdisplay with 0.33" diagonal to achieve Full HD 1080p resolution



JDC Introduction

- **Our mission:**
Complete and support the "ECO system"
for the LCoS application environment



http://3.bp.blogspot.com/_W7cYxYQ6wTQ/S8krA_B0jMI/AAAAAAM/7meO-7C-yII/S700/mundo_verde_en_mano.gif



- **Core Technology: "Pixel"**
Our "Pixel" is the best available in the market. WE have the most powerful Pixel processing while our Pixel Library is expanding.



JDC Core Technology

Pixel & Controller:

We have 6.4um & 3.74um pixels now, and a 2.68um pixel is in planning; Our pixel is robust, easy scalable, and has the best programmability.



<http://ifen.bauv.unibw.de/snun/template/img/cooperation.JPG>

Small Investment	Scaling up requires only a relatively small investment. E.g. the reconfiguration of 6.4um to 8um pixels is straightforward, as is the creation of 16x9, 4x3, square, or cinema standard formats. Turn around times are 6-9 months.
Flexibility	2k1k, 4k2k, and 8k4k are in planning.
Customization	Die sizes range from .35" up to 1.4" (based on 2M pixels) depending on customer requirements.
Total Solution	Family product : 1k1k, 2k1k, 2k2k, 4k2k, 4k4k, 8k4k We will have a general purpose controller (around 2Q, 2014) for our panels, based on 40 nm technology w/embedded memory.

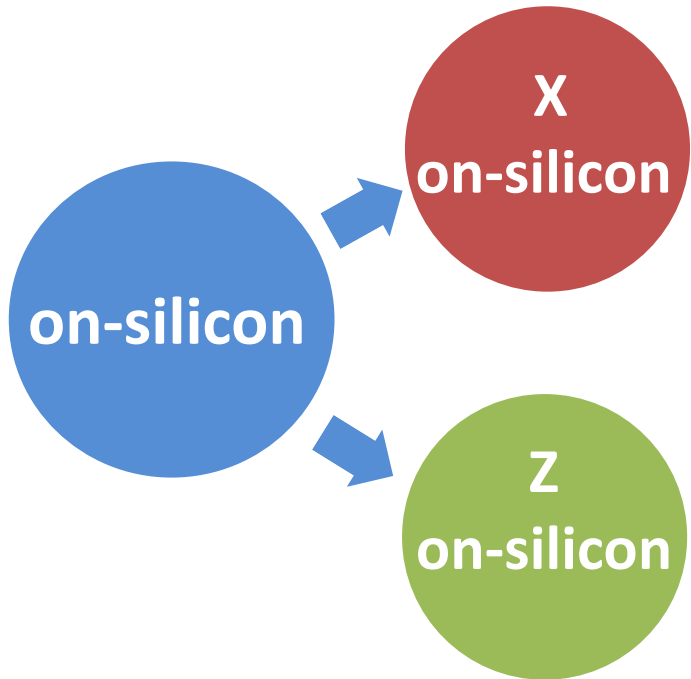


JDC Business Model

- **On-Silicon Strategy**



<http://mac-kennyglobal.com/wp-content/uploads/2012/07/mackenny1.jpg>



“X” is our partners who are functional material providers.

We are able to work with world leading partners to serve our customers in different application such as LCoS, OLEDoS, uLEDoS, FLC and etc.

“Z” is our target customers who have domain know-how in specific applications.

Our target customers are mainly experts in the fields of optics and materials, who are able to leverage their expertise in electronics, mechanical and IC design development.



JDC Product Line

Wafers

2K x 1K : 0.55" & 0.7" available now
4K x 2K : 0.7" tape out in July. Functional but undergoing engineering evaluation.

Micro-display

We sell panels as a service, and accept custom projects with NRE. Our average project turnaround time is 6-9 months.

Controller ASIC

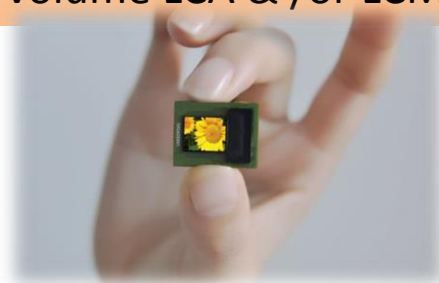
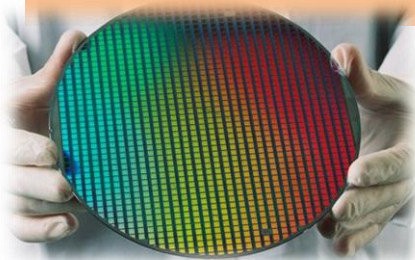
We have the pixel in our Pixel Library. For example, 2K x 2K @ 0.68" or 0.87"; 4K x 2K @ 1.1" or 1.4"; 8K x 4K @ 1.4". We will have a controller ASIC available in Q2/2014.

Development Kits

We have development kits available directly from us or from our partners.
Our Education Kit using "2M" Pixels is coming soon.

Mini-FAB

We are preparing a proposal for mini-FABs to enable small volume LCA & /or LCM capability for customers.



~ Thank You ~

For more information, please visit:



www.JasperDisplay.com