

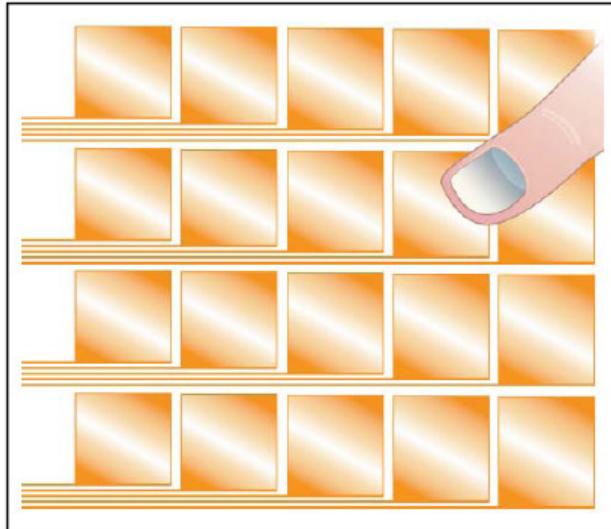
Orient Display

Technology Leader in Capacitive Touch

www.orientdisplay.com

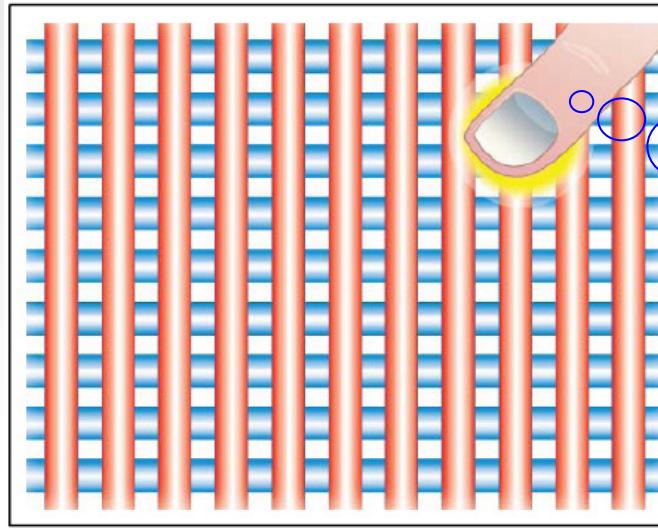


Self Capacitance: Two Types



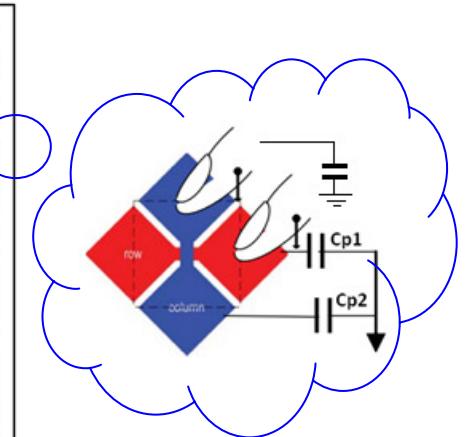
Single Layer

Multiple separate touch pads arranged in a **single** layer.
Each pad is scanned **individually**.



Two Layer

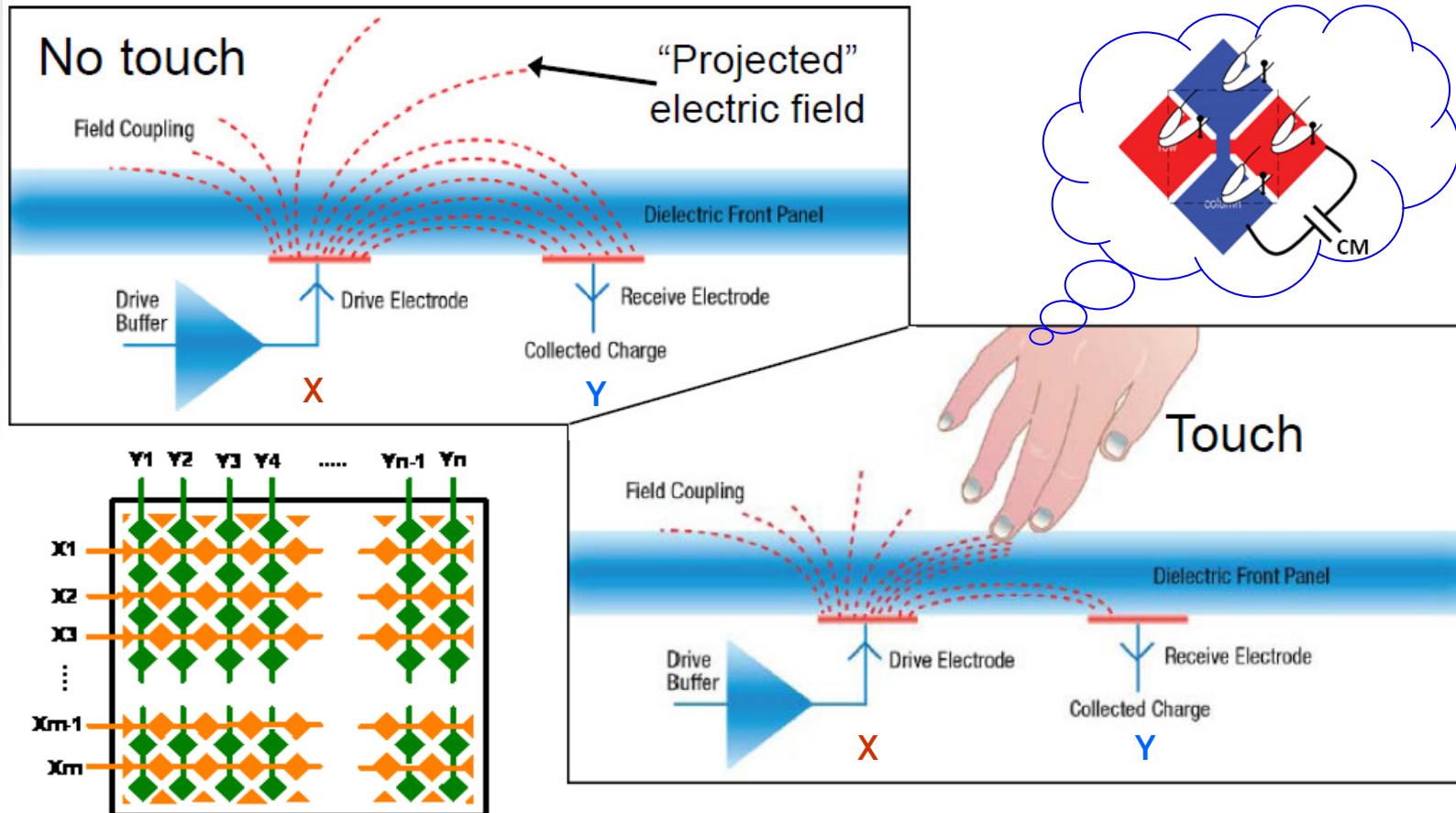
Rows and columns of electrodes arranged in **two** layers.
Each electrode is scanned **in sequence**.



Low cost, but cannot support multi-touch or gestures;

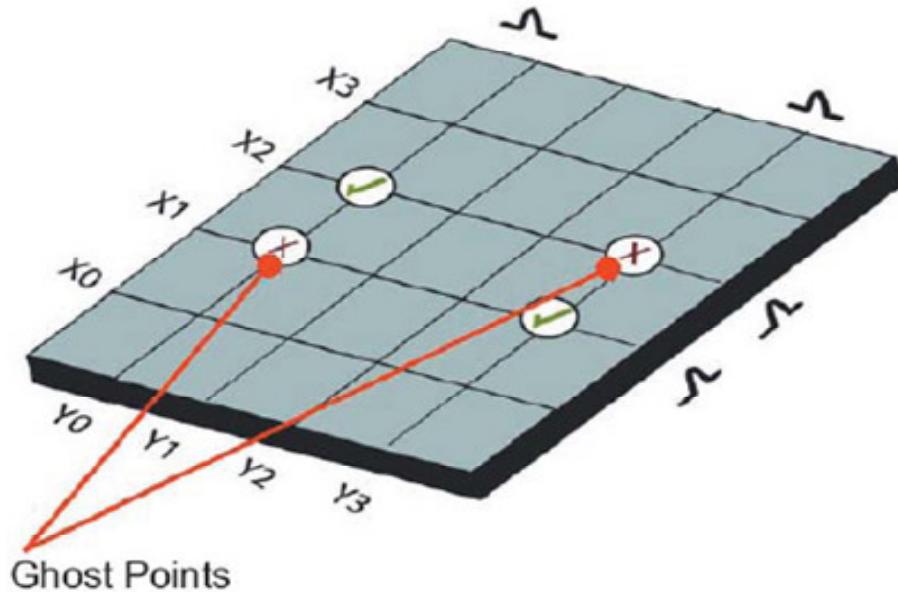
Low noise immunity

Mutual Capacitance Principle



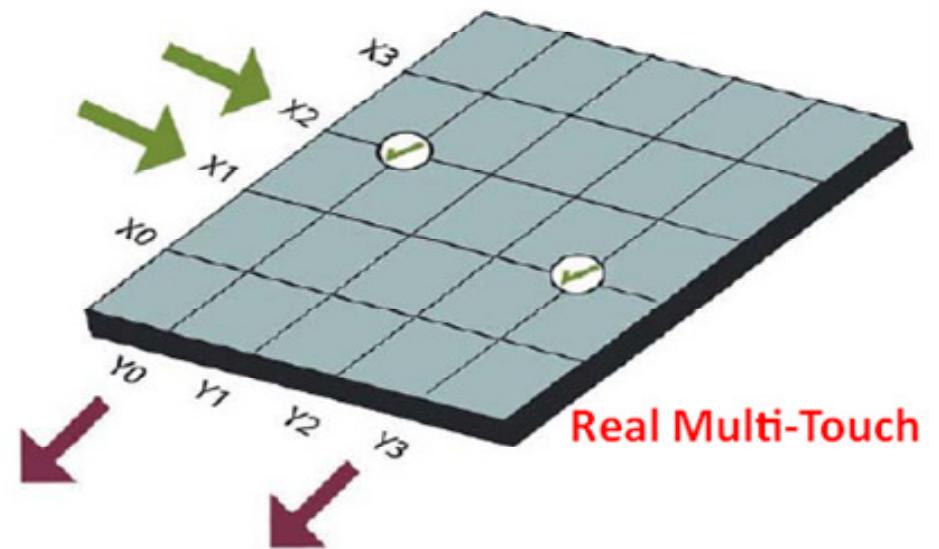
**The change in capacitance at the point of *intersection*
between X and Y is detected**

Self Capacitance vs. Mutual Capacitance



Self Capacitance:

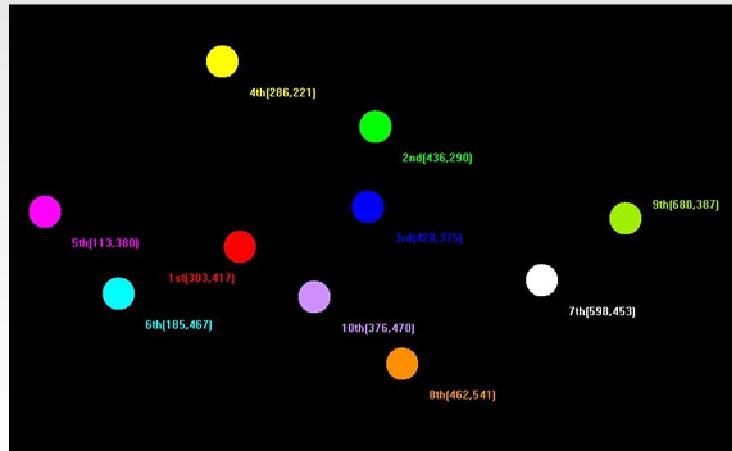
- ▶ Simple Construction
- ▶ Low Cost
- ▶ Limited to 1 or 2 Touches
- ▶ Ghosting is a Problem
- ▶ Lower Immunity to Noise



Mutual Capacitance:

- ▶ More Complex
- ▶ Higher Cost
- ▶ Up to 16 touches
- ▶ No Ghosting
- ▶ Higher Immunity to noise

Mutual Capacitance (P-CAP) Touch



X-Y coordinate
Multi Touch, 10 points



X-Y coordinate
5 points



X-Y coordinate
2 points



X-Y coordinate
Single touch

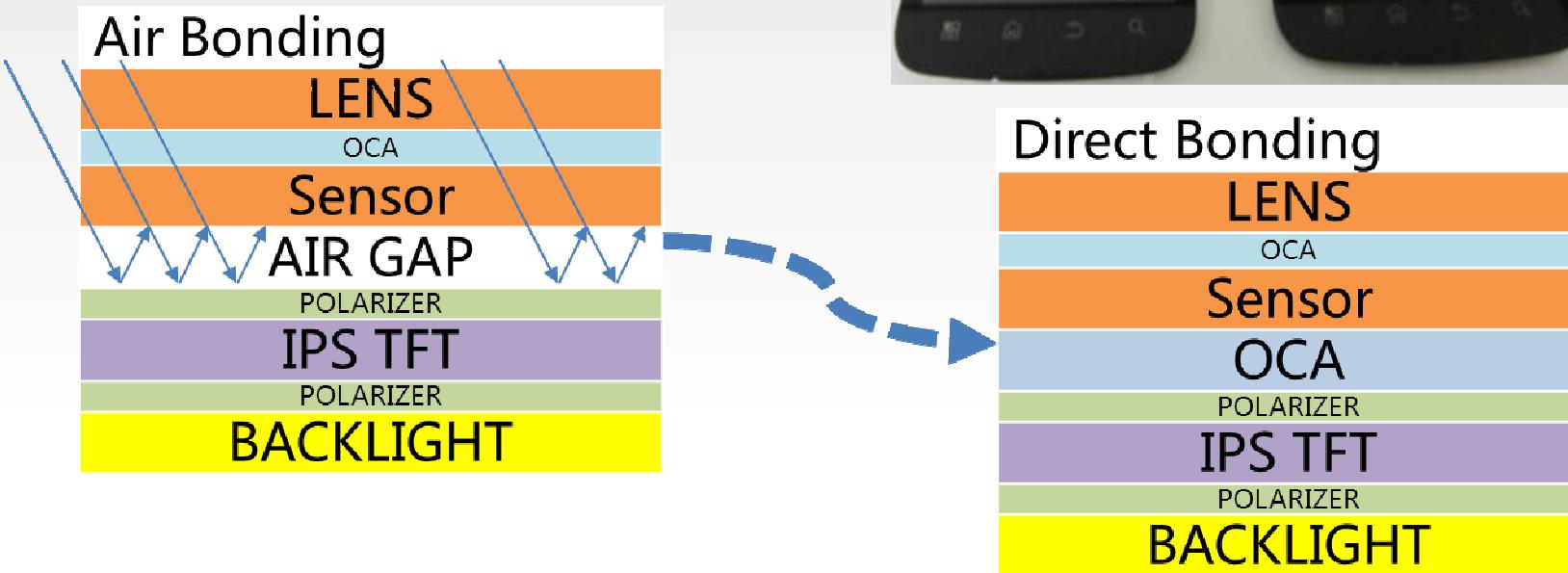


Touch button
Fixed area

Mutual capacitance can support multiple touches from 1 point (fixed button) up to 16 points.

Projected capacitance also supports gestures: swipe, pinch, stretch, rotate, tap, double tap, flick, drag, etc.

Optical Bonding



Optical bonding provides better optical performance:

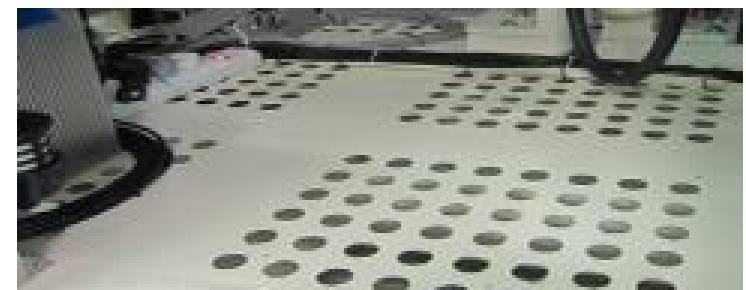
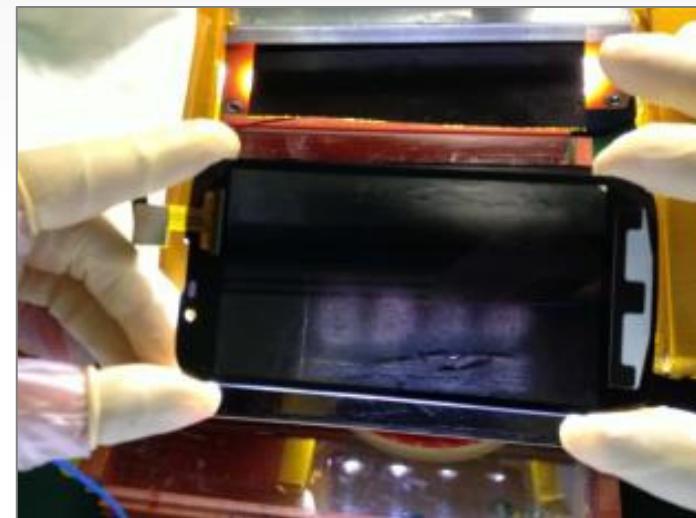
- ▶ Improved sunlight readability in outdoor use
- ▶ Improved transmission, contrast, and brightness
- ▶ Power saving without backlight modification

No moisture condensation or debris

Improved mechanical performance.

Optical Bonding Automation

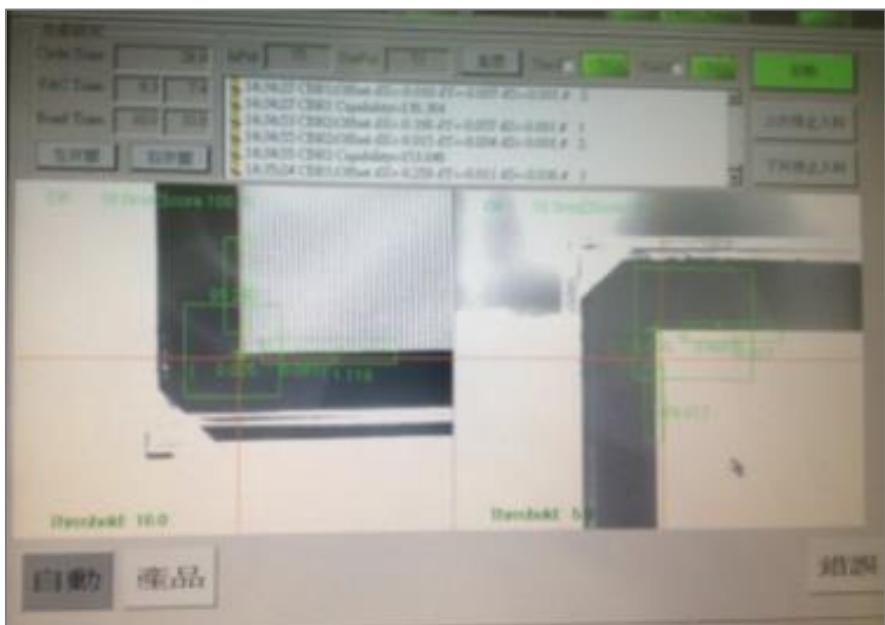
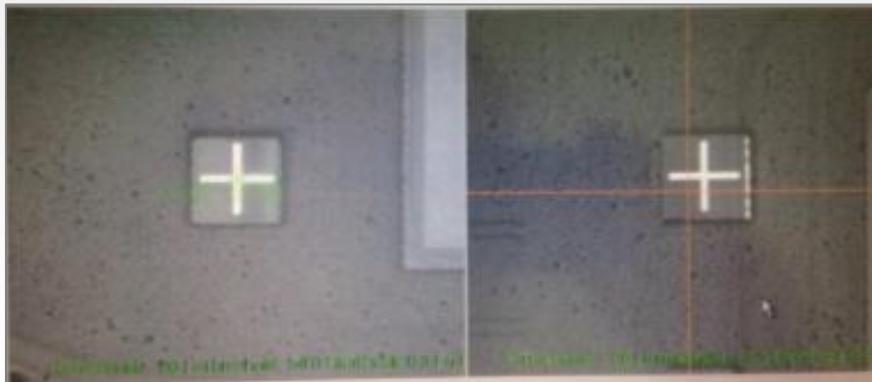
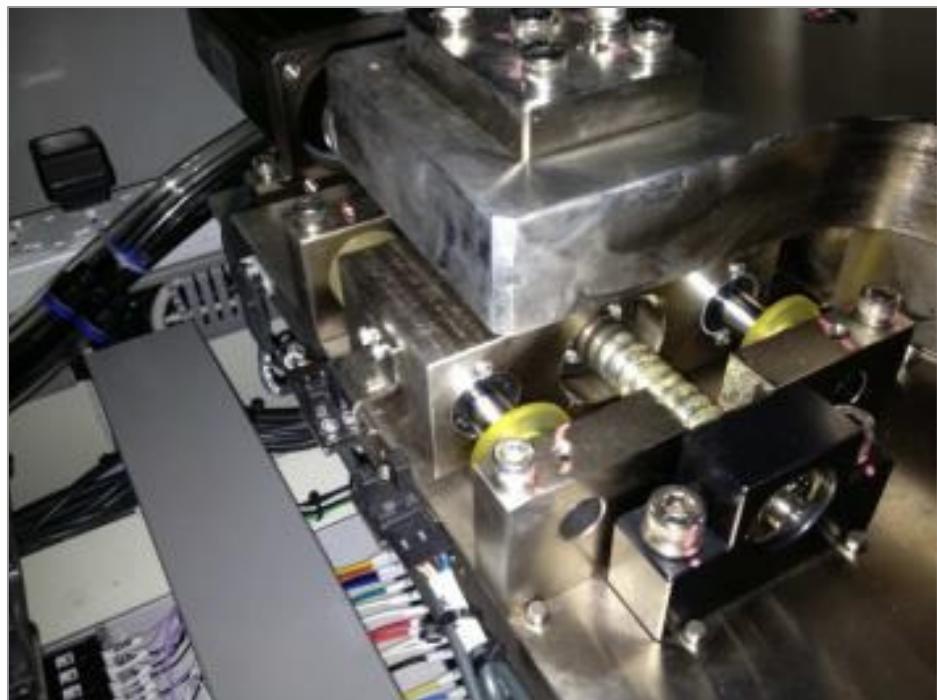
**Robot transports CTP & TFT LCD into vacuum chamber.
Improves manufacturing efficiency.**



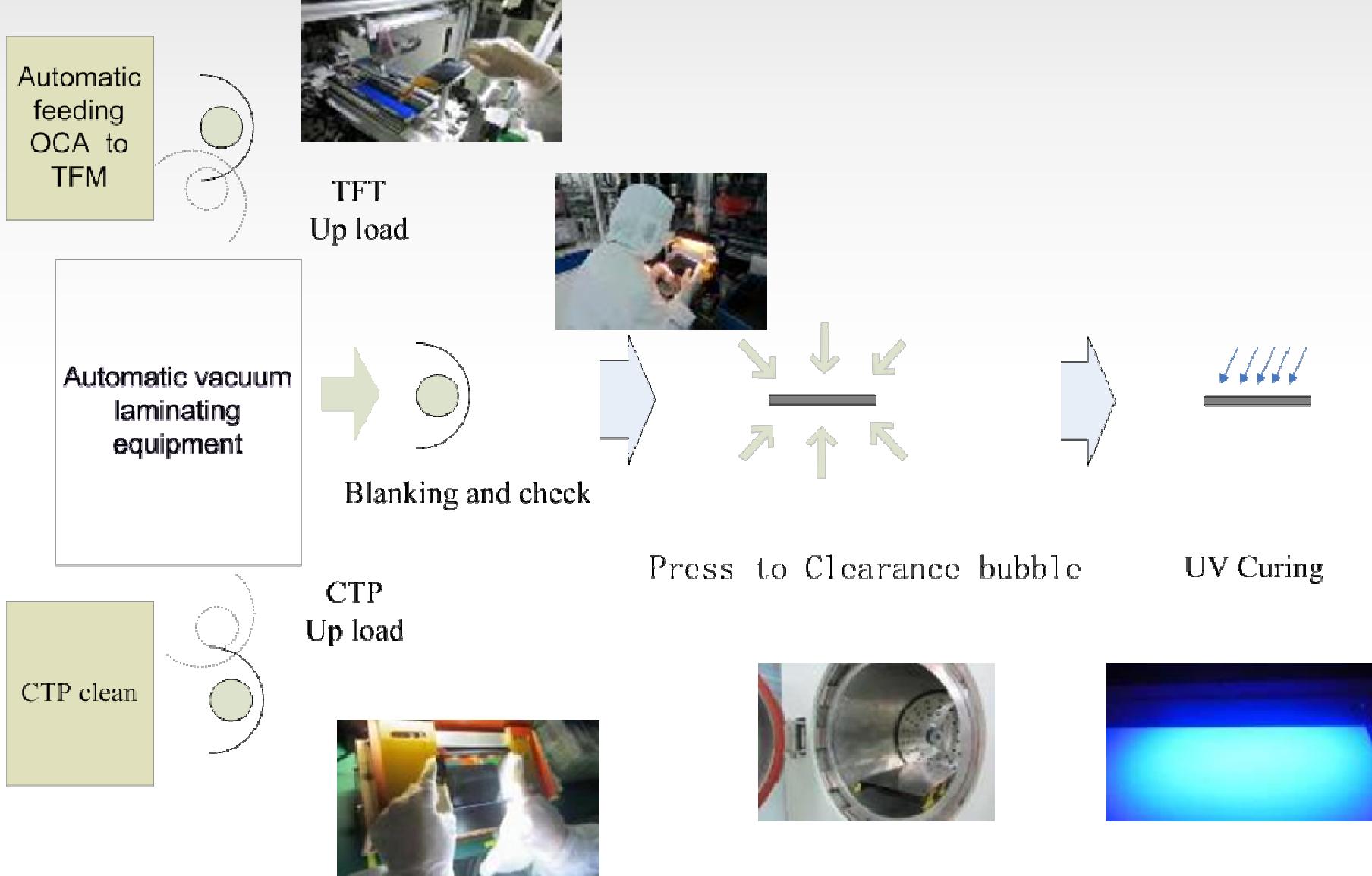
CCD Automatic Positioning System

4 Axis positioning: X, Y, Z, θ

Auto position before lamination



Optical Bonding Process Flow

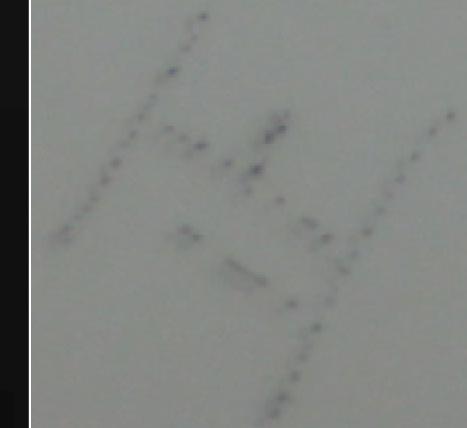
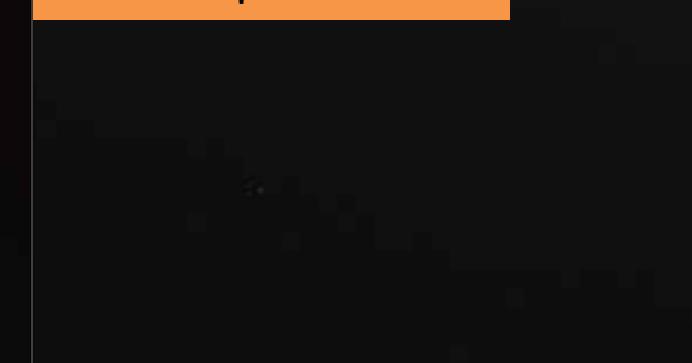


Anti-Fingerprint Coating

With AR treatment



After wipe



Untreated

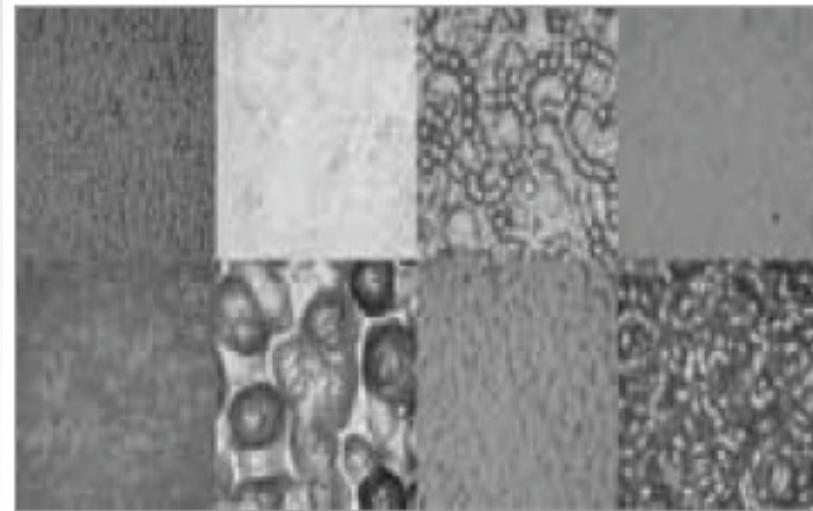


After wipe

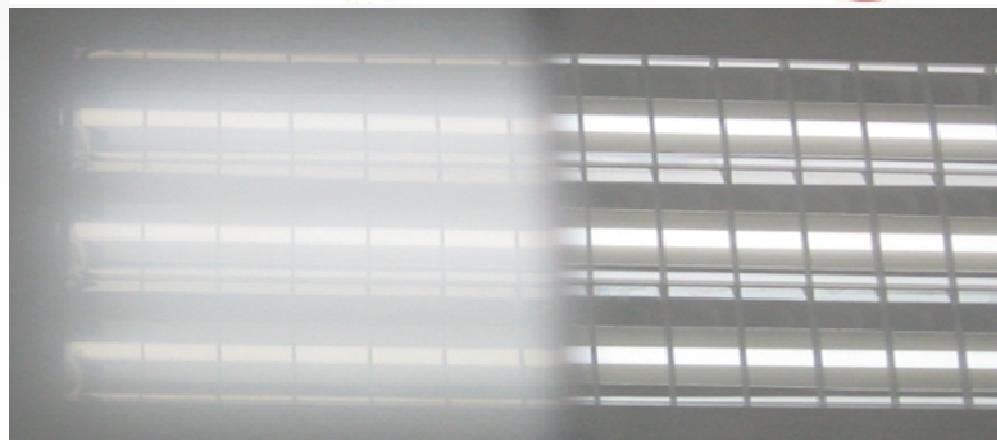
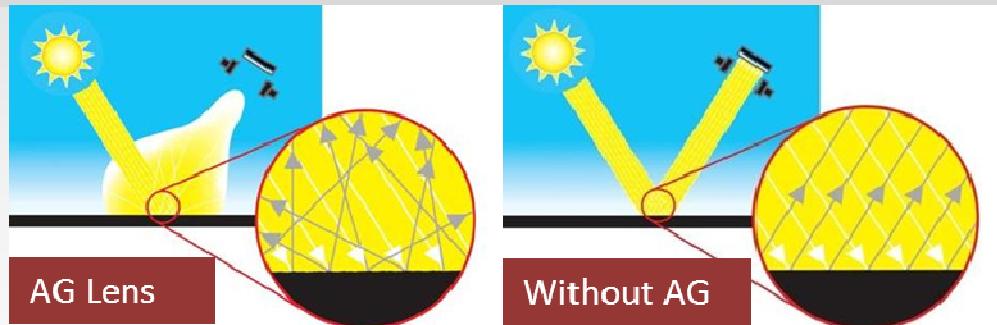


- ▶ **Special chemical coating to repel water and oil**
- ▶ **Provides ultra-slippy glass surface**
- ▶ **Improves touch screen operability**

Anti Glare Cover Lens: Etch, not Film



Different types of surface structuring leading to different optical and touch properties (Source: Berliner Glas)



Anti Glare is achieved in the touch panel by etching the glass lens. This significantly reduces glare in high ambient lighting and bright sunlight.

Anti-Impact Cover Lens



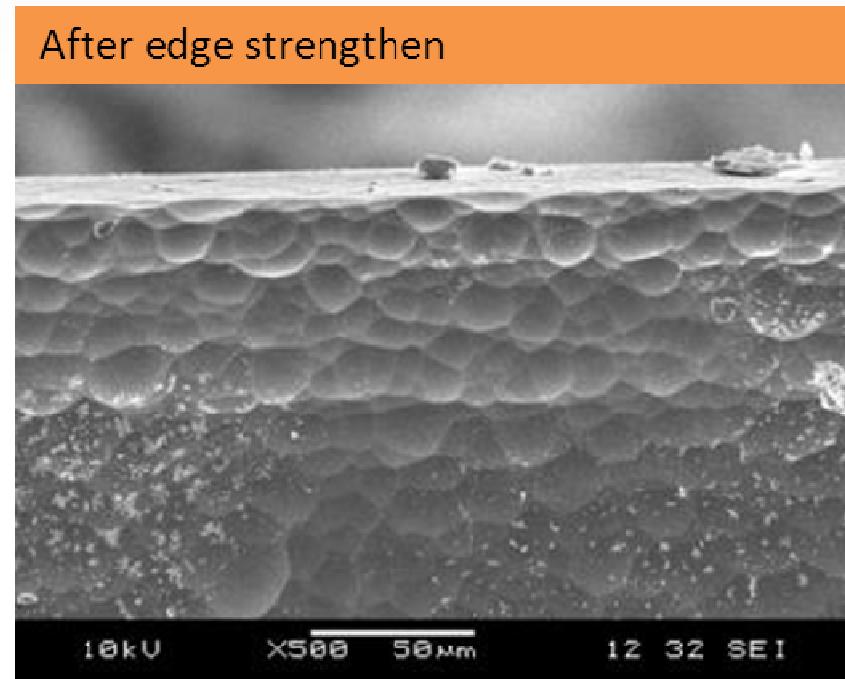
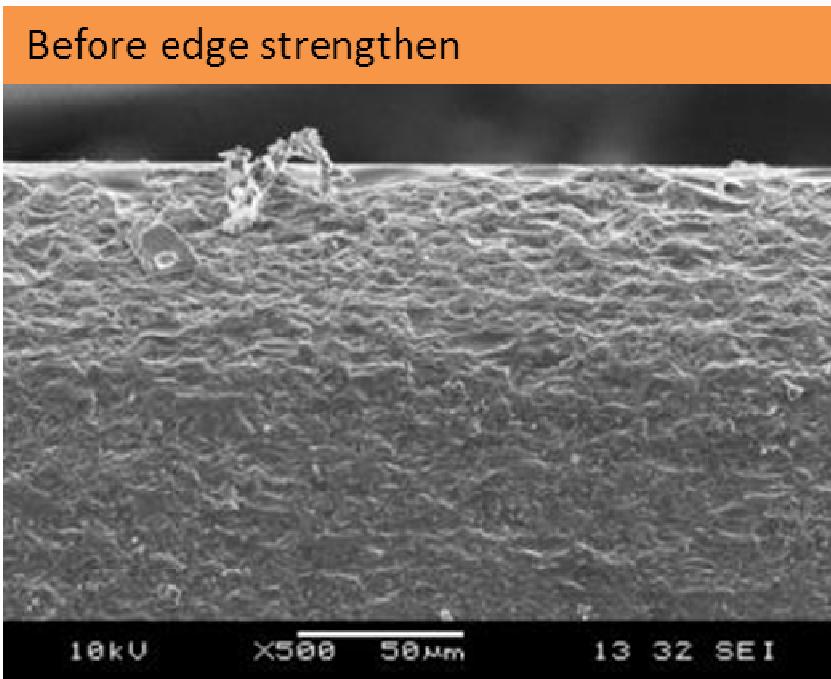
- ▶ Protection against external mechanical impact
- ▶ 5mm cover glass after chemical strengthening
- ▶ Impact energy up to 10 Joules
- ▶ Impact from 12 pound steel hammer

Orient Display Process = Safe & Green

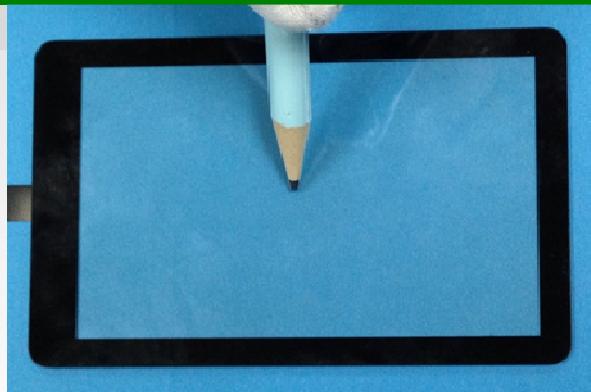
Strengthen glass sheet before cutting;

Avoids HF Etch process (toxic to environment);

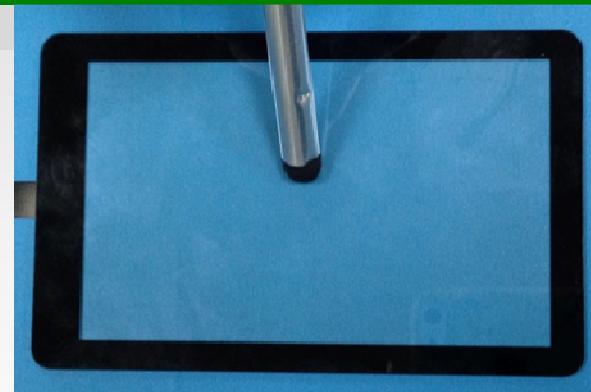
Result: Higher Compressive Stress (CS): 4PB strength > 700MPa



Multi Touch with Finger, Pen, & Gloves



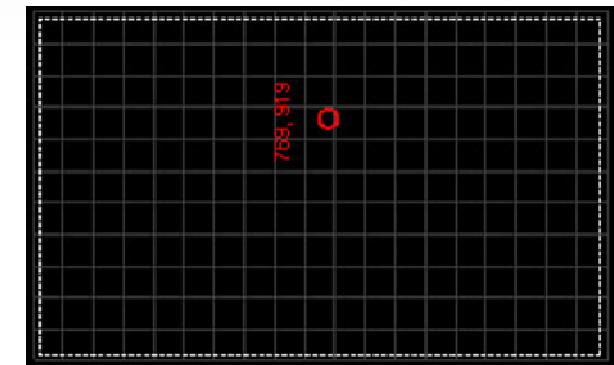
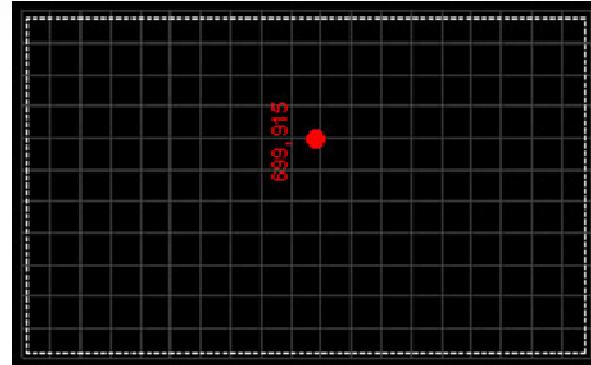
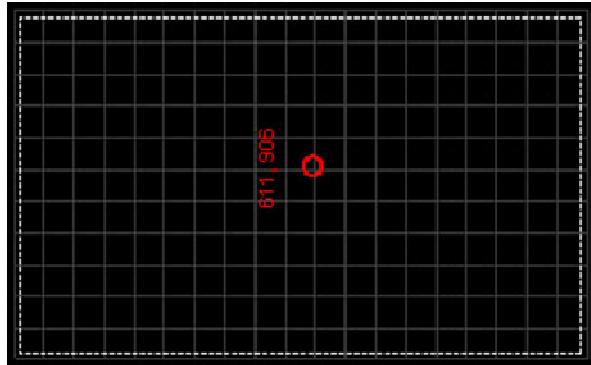
2mm diameter pencil



7mm diameter rubber



5mm thickness gloves



Automatic recognition of passive pen/glove/finger

Support pen / pencil diameter = 2mm minimum

Gloves up to 5mm thickness

Minimize Borders with White OGS

White OGS permits narrow border with photolithographic exposure process instead of printing; results in higher productivity & lower cost.



IMITO = Index Matched ITO



Before



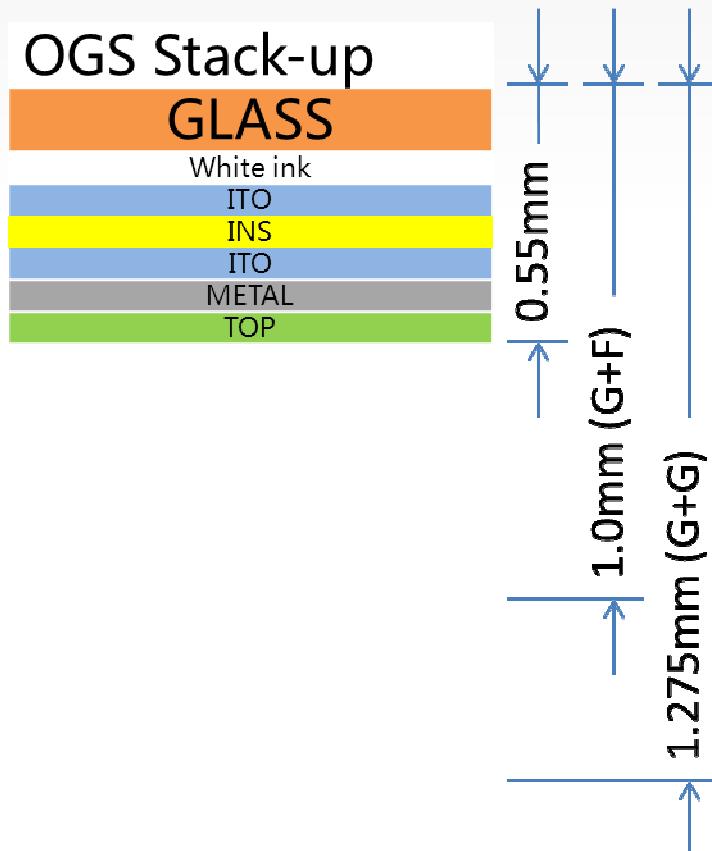
After

- ▶ Reduce internal reflections of ITO pattern
- ▶ Less color difference between black ink & touch screen
- ▶ High transmittance improves optics in sunlight

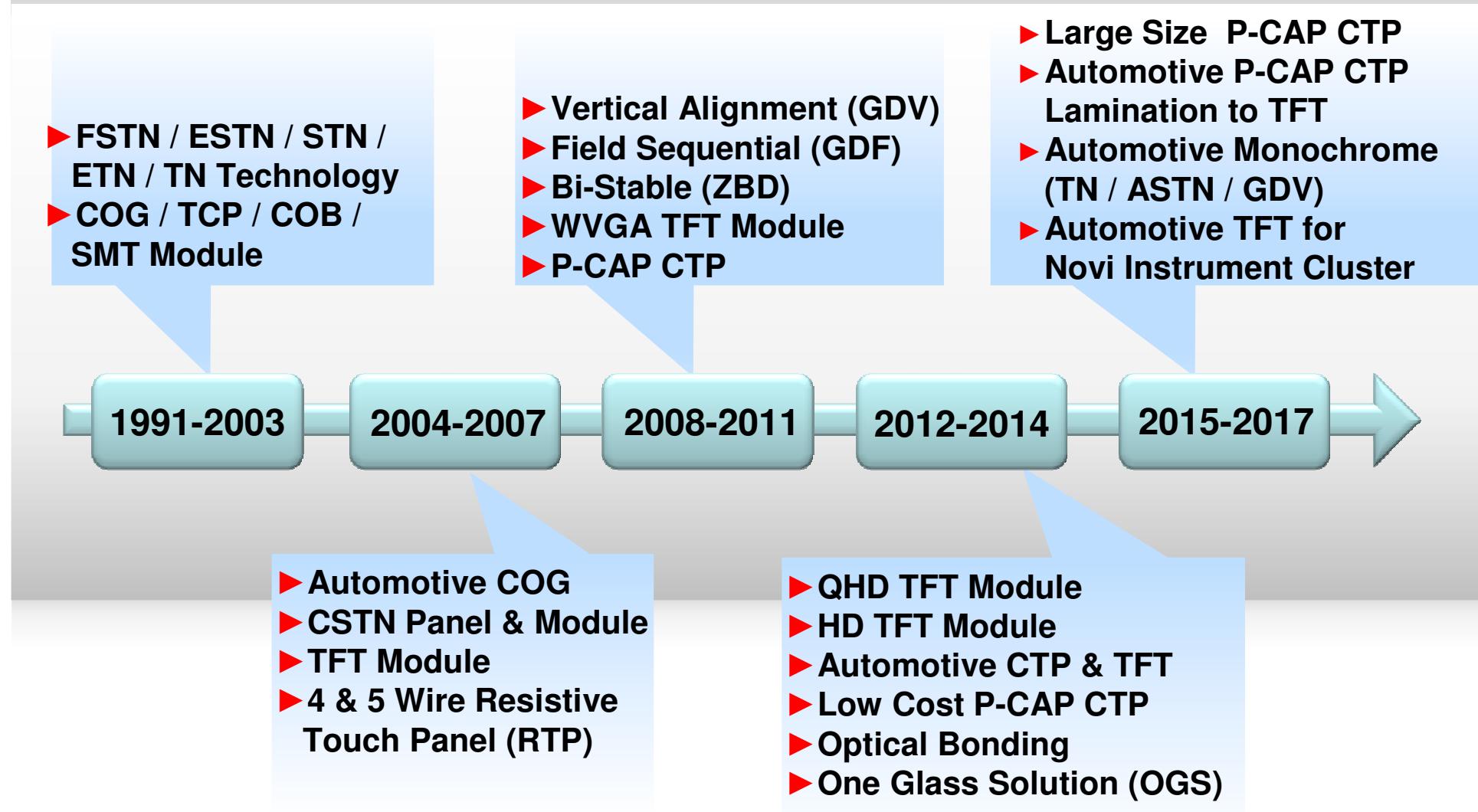
Ultrathin OGS

Thinnest OGS touch screen in mass production: **0.55mm**

G+F touch screen = 1.0mm; G+G touch screen = 1.275mm

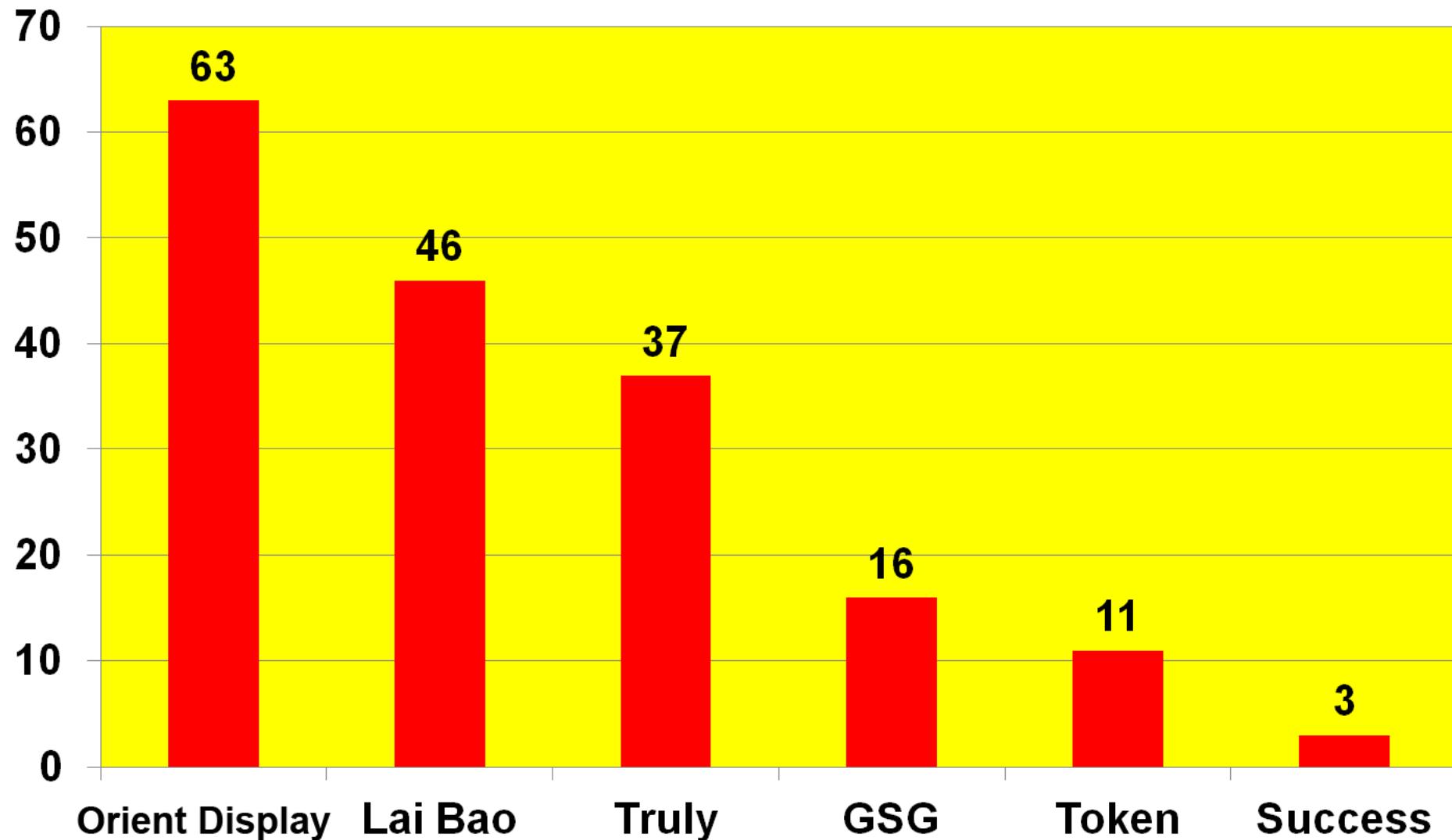


Orient Display Technology Development Roadmap



China's Technology Leader in Capacitance Touch

China Patents for Capacitance Touch



Example of Orient Display Leadership

- ▶ Ultra Thin 5.0" HD TFT
- ▶ 720 x 1280 IPS TFT
- ▶ MIPI Interface
- ▶ 440 nits at Surface
- ▶ Integrated CTP with OGS
- ▶ Optical Bonding
- ▶ FT5336 CTP Controller
- ▶ 2.3mm Thin Total
- ▶ Toper = -20C to +70C



Touch Panel Technology: Orient Display is #1



First Lady Peng Liyuan, wife of Xi Jinping, Chairman of the People's Republic of China, takes pictures next to Volkswagen CEO, Martin Winterkorn in Berlin, Germany. The phone she is using is ZTE's Nubia model Z5, featuring a Sharp HD TFT with a Projected Capacitance Touch Panel made by Orient Display. This combination features the latest technology from Orient Display including OGS and Optical Bonding.

Three Recent Design Wins for 8.0" P-CAP CTP



Pioneer
sound. vision. soul



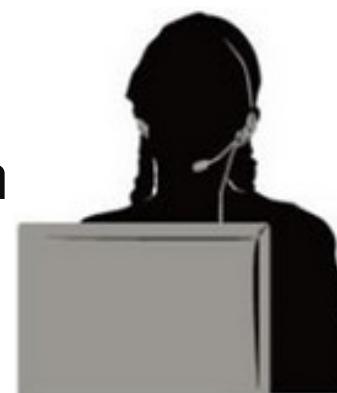
Production starts in 2015

Red Carpet Service

- ▶ 24 hour response to all communications.
- ▶ Delivery from stock on many products.
- ▶ 3 weeks for initial samples of customized products.

If there is a problem or concern:

- ▶ 3 days for initial analysis after sample receipt;
- ▶ 4 days for detailed 8D report.
- ▶ Orient engineers can assist with communication end customer for special cases if required.
- ▶ Timely follow-up of corrective actions.



Features & Benefits from Orient Display

- ▶ Qualified supplier of display products for Top Tier Partners.
- ▶ #2 Manufacturer World Wide in LCD Monochrome (Passive).
- ▶ China's Technology Leader in Projected Capacitance Touch.
- ▶ Technical and Sales Support in Seattle and Toronto Office.
We understand the applications. We know our competitors.
- ▶ Warehouse in Seattle provides fast sampling of display modules, eval kits, demos, and special stocking plans for selected customers.
- ▶ Willing to develop and manage special terms and conditions for key customer partners.

Orient Display Strength in Long Term Partnership

► Factory:

- Production Capacity
- Competitive Pricing
- On Time Delivery
- Quality & Service System
- Quick Response on Issues

► Focused on Technology:

- Invest >5% of Sales into R&D
- 1 in 5 Employees is an Engineer
- Strong Technical Support
- Quick & Correct Answers to Questions



► Orient Display:

- Top Brand Supplier
- Stable Resource
- 10 yr + Product Support
- Reliable & Honest

► Existing Customers:

- Fortune 500 Companies
- Long Term Partnerships
- Close Cooperation