



Projected Capacitive Touch Panel Presentation

---Application for Industrial, Automotive & Home Appliance

December 2013

Agenda

➤ **Projected Capacitive Touch Technology Introduction**

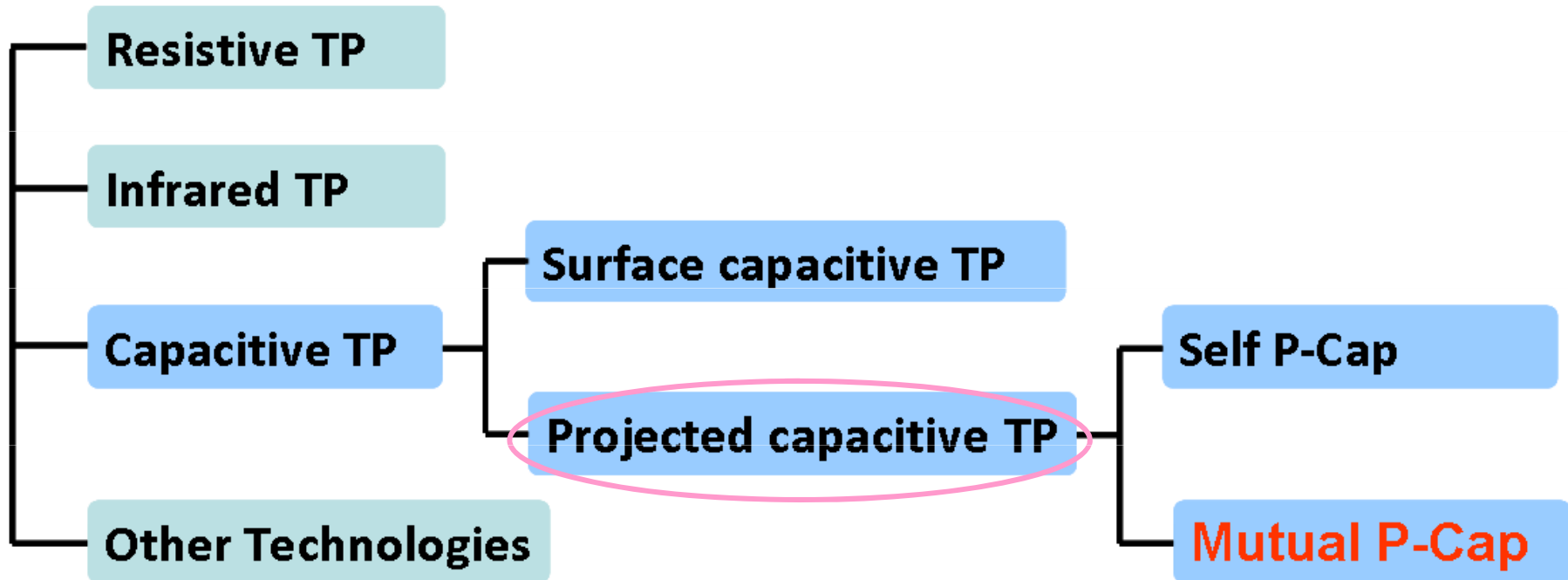
- Basic Introduction
- Principle of P-Cap (Self & Mutual Capacitance)
- Orient Display P-Cap Sensor Structure

➤ **Orient Display P-Cap Touch Panel's Development Situation**

- Development History / Industrial Chain Layout / CTP Patent Layout
 - Main Application of Orient Display Touch Module
 - Orient Display Touch Solution Roadmap
 - Orient Display Technology Roadmap
-

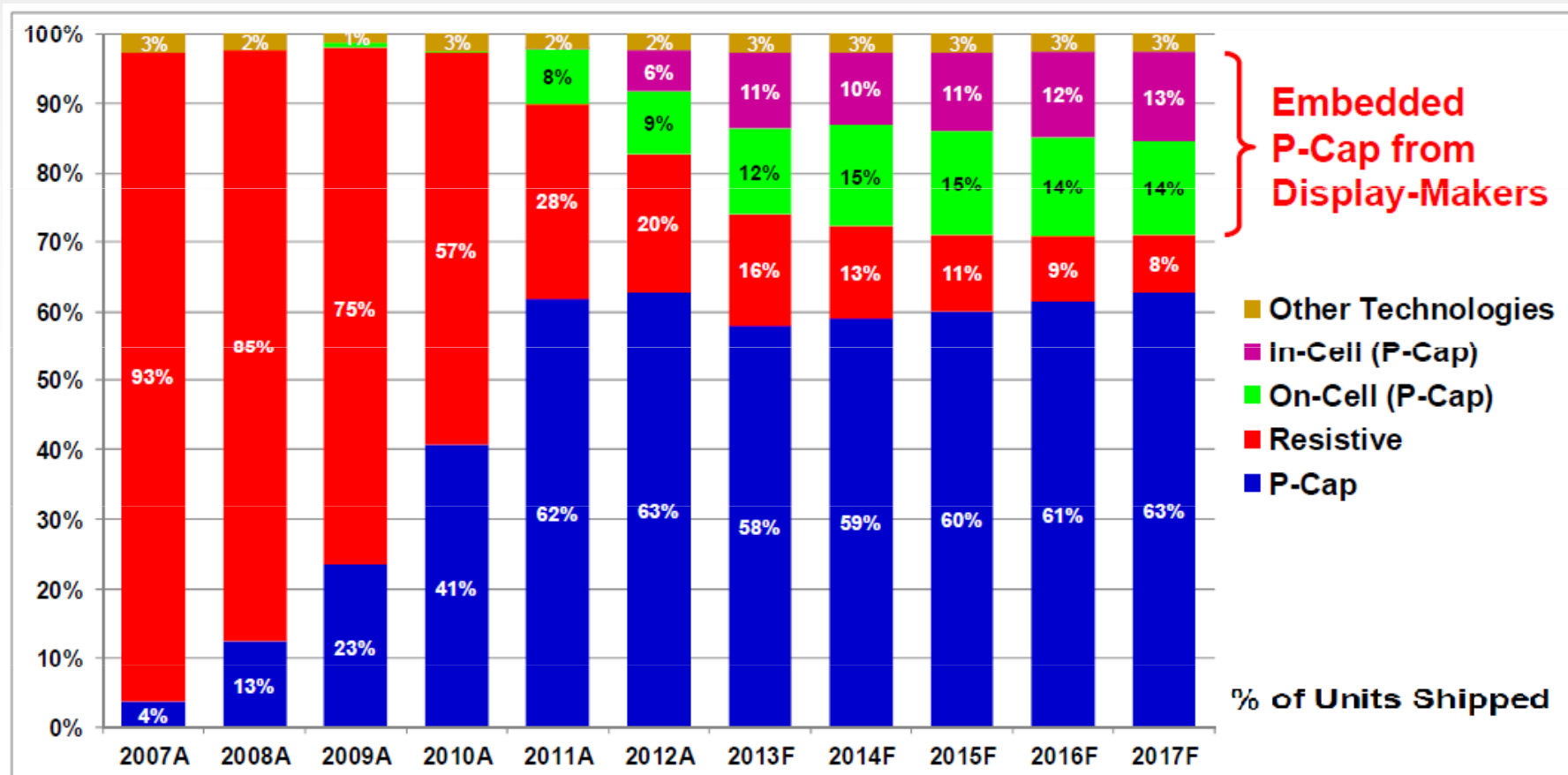
Basic Introduction...1

❖ Common Touch Panel Category



Basic Introduction...2

❖ Touch-Panel Market 2007-2017 by Technology (Units)



Source: DisplaySearch Touch-Panel Market Analysis Reports

Basic Introduction...3

Main **Feature** of

Projected **Cap**acitive Touch Module :

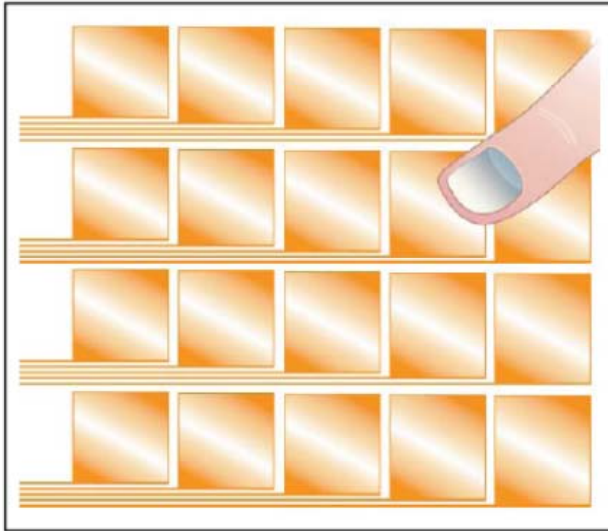
- High light transmittance
- Durable and scratch-resistant
- Zero operating force
- Support true multi-touch and gesture recognition
- High accuracy, linearity and sensitivity
- Excellent Signal-to-noise (SNR)
- Faster refresh rate
- No calibration is required
- High reliability under harsh environment

New feature:

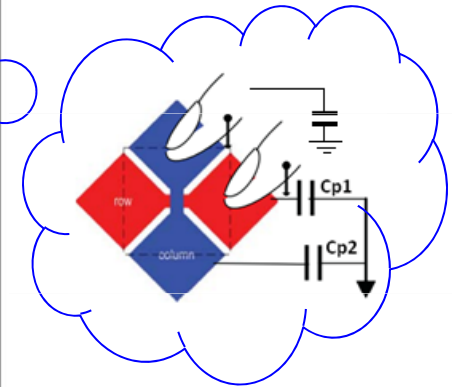
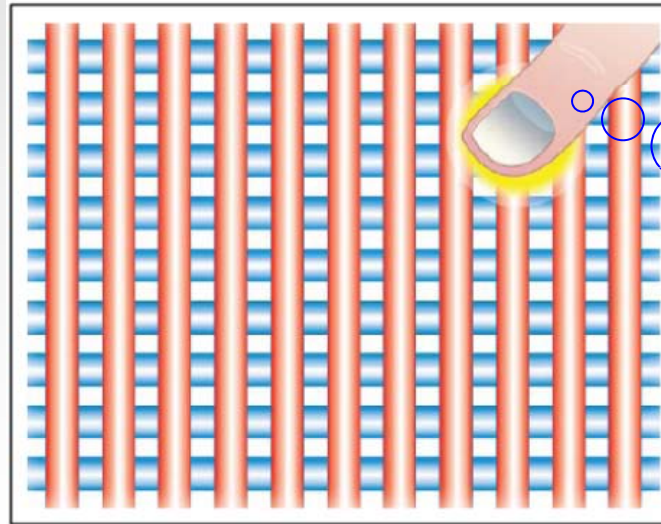
Support for **gloves**, **stylus** and **hover** touch.



Self-Capacitance Principle



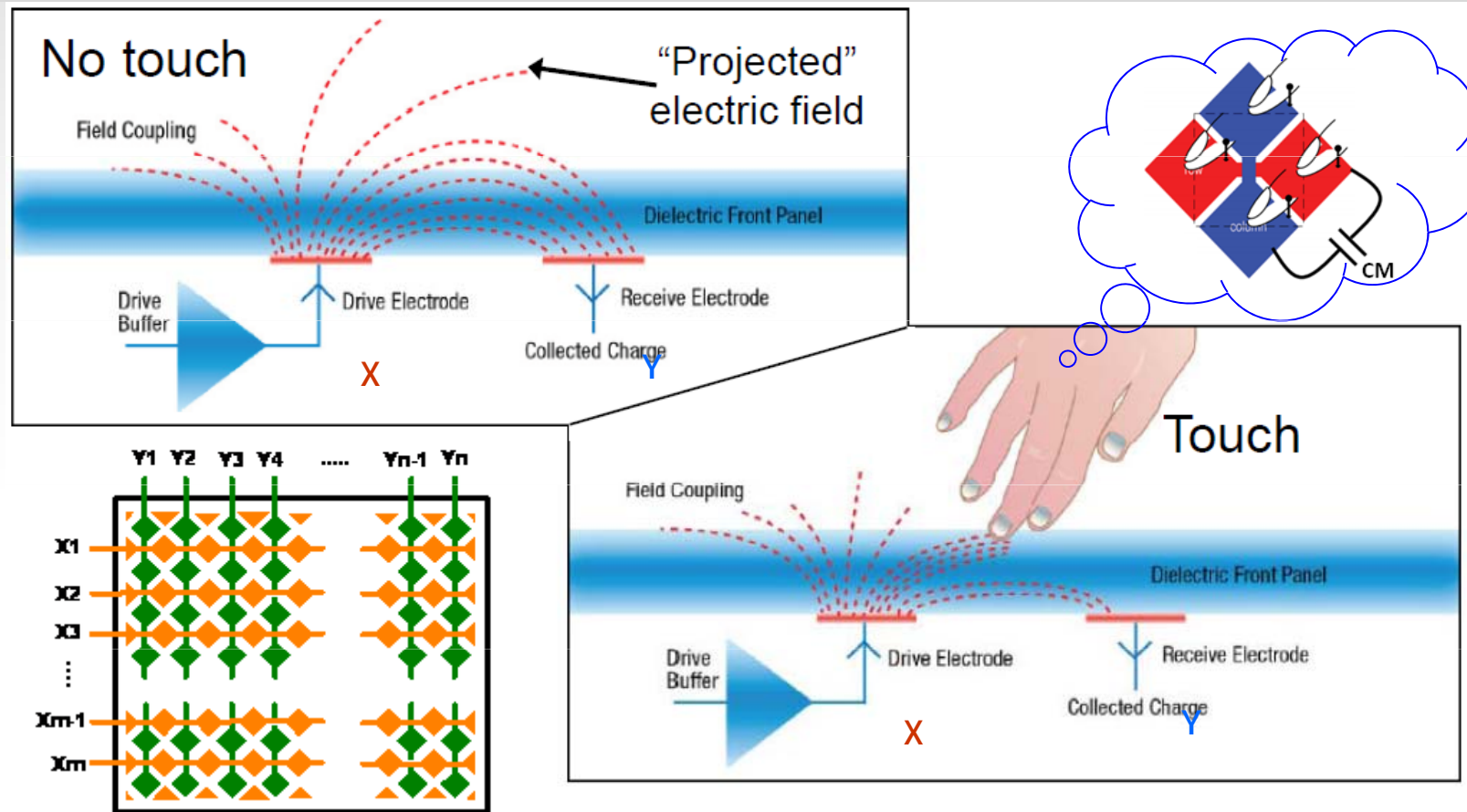
- Multiple separate touch pads in a **single** layer.
- Each pad is scanned **individually**.



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

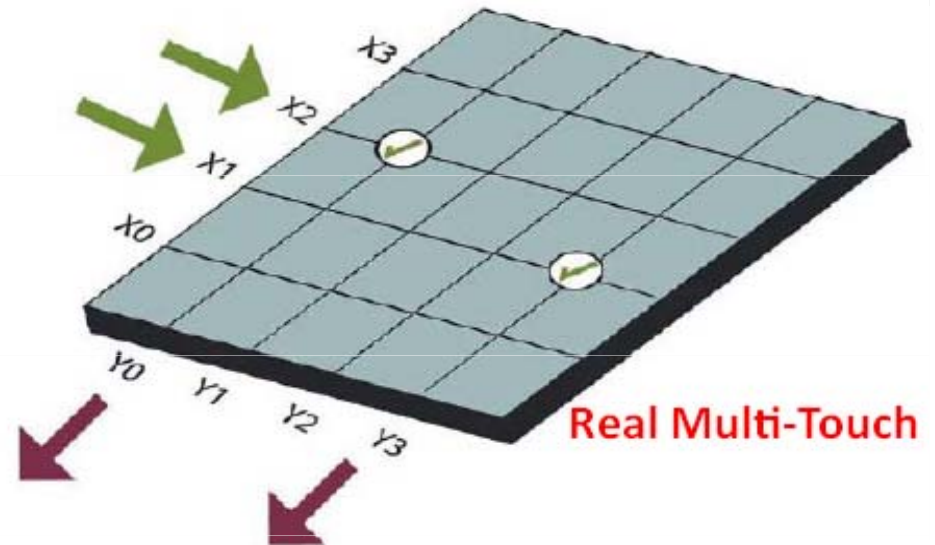
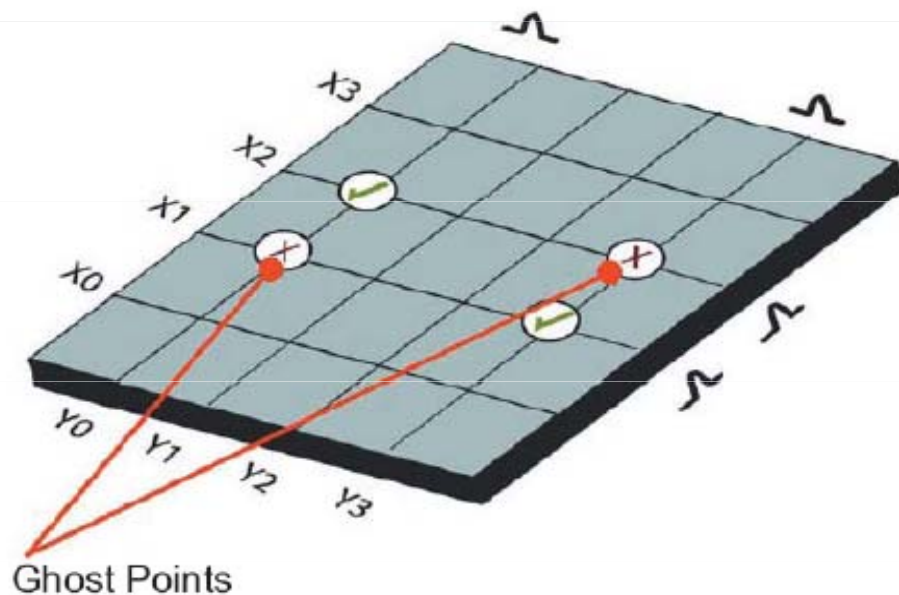
The **capacitance readings** are taken for each sensor electrode **individually**.

Mutual-Capacitance Principle



The **change** in **capacitance** at the point of **intersection** between X and Y would be detected.

Self-Capacitance Vs. Mutual-Capacitance



Self-Capacitance:

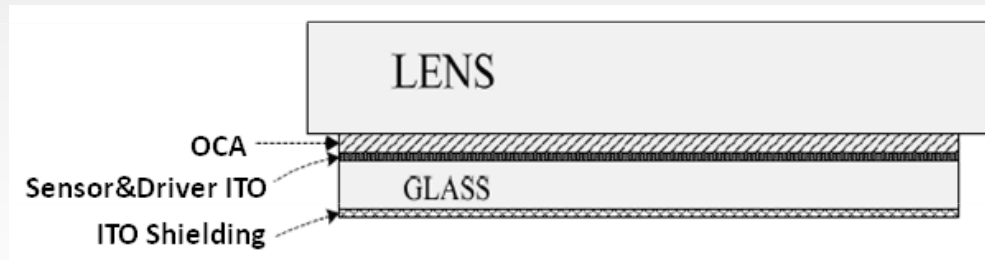
- ✓ Simpler
- ✓ Low cost
- Limited to 1 or 2 touches with ghosting
- Lower immunity to noise

Mutual-Capacitance:

- More complex
- Higher cost
- ✓ Support unambiguous touches (Up to 16)
- ✓ Higher Immunity to noise

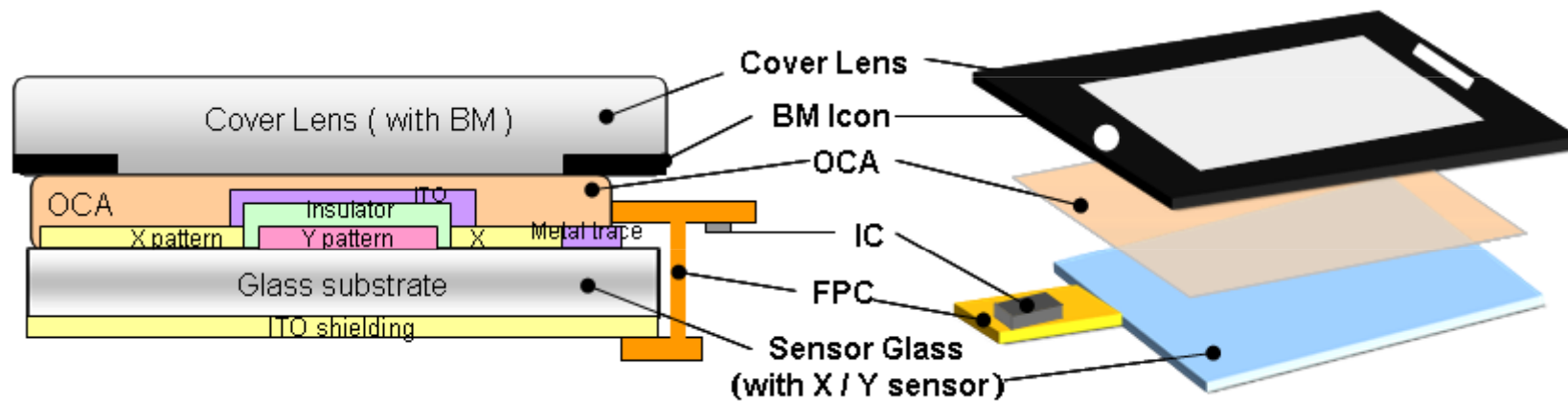
P-Cap Sensor Structure...1

G+G SITO Stackup



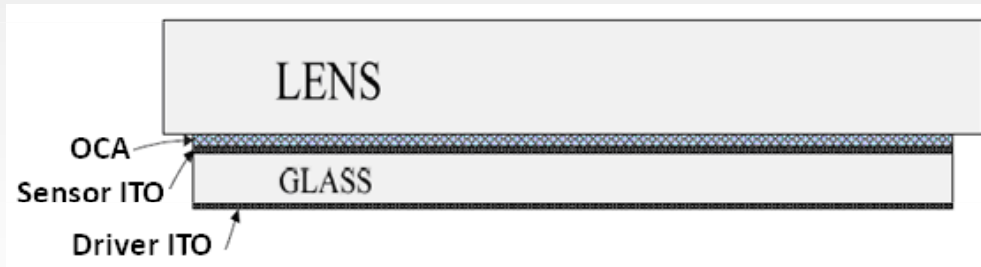
Recommended Application:

- ✓ Industrial Instrument
- ✓ Automotive
- ✓ Tablet



P-Cap Sensor Structure...2

G+G DITO Stackup



APPLE INC Patented Structure

Patent No : [ZL200810125849.6](#) &

[US7920129](#)



DOUBLE-SIDED TOUCH-SENSITIVE PANEL WITH SHIELD AND DRIVE COMBINED LAYER

Inventors: **Steve Porter Hotelling**, San Jose, CA (US); **Brian Richards Land**, Redwood City, CA (US)

Assignee: **Apple Inc.**, Cupertino, CA (US)

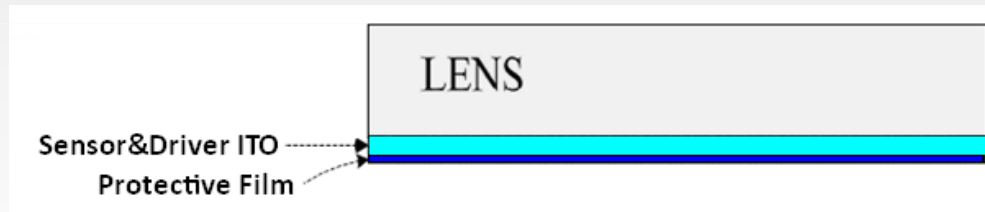
Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1116 days.

Appl. No.: **11/650,182**

Filed: **Jan. 3, 2007**

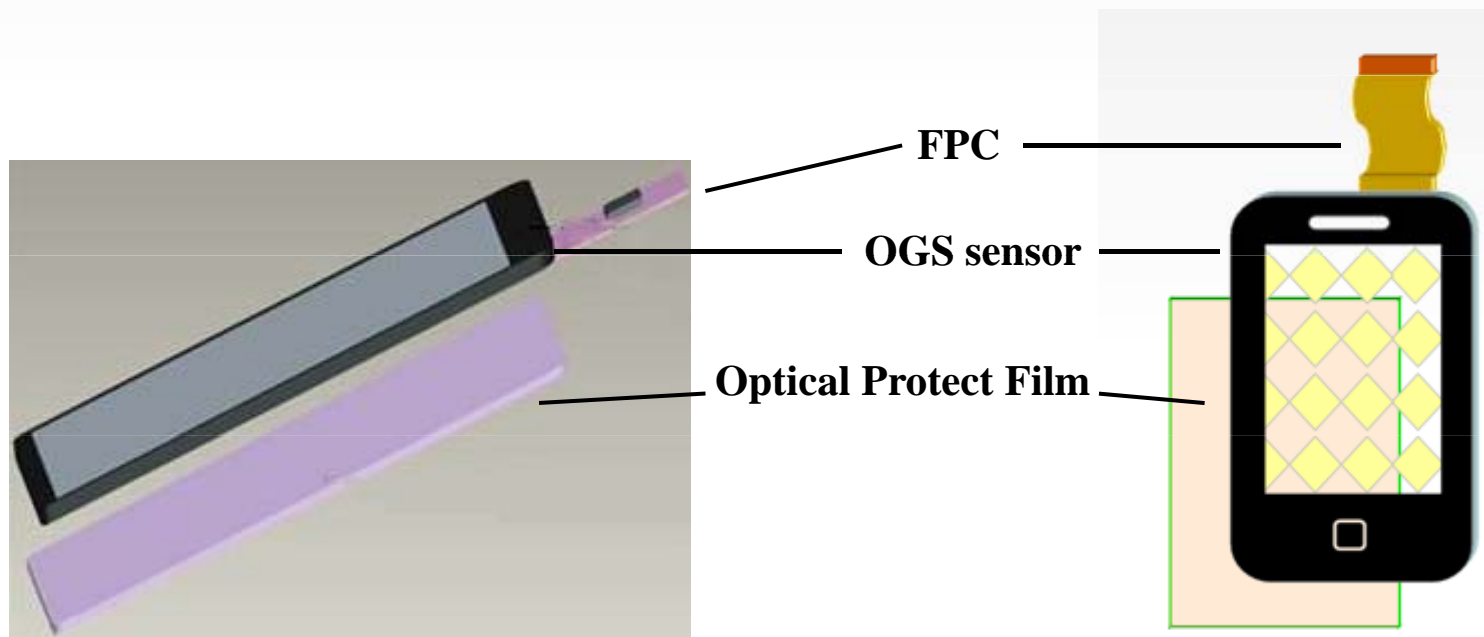
P-Cap Sensor Structure...3

OGS (One Glass Solution) Stackup



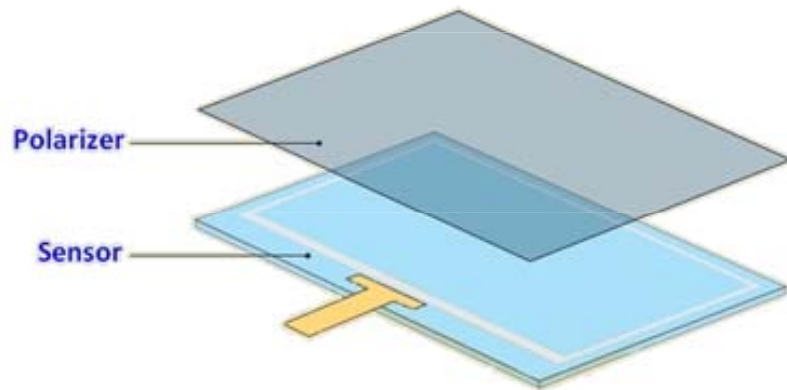
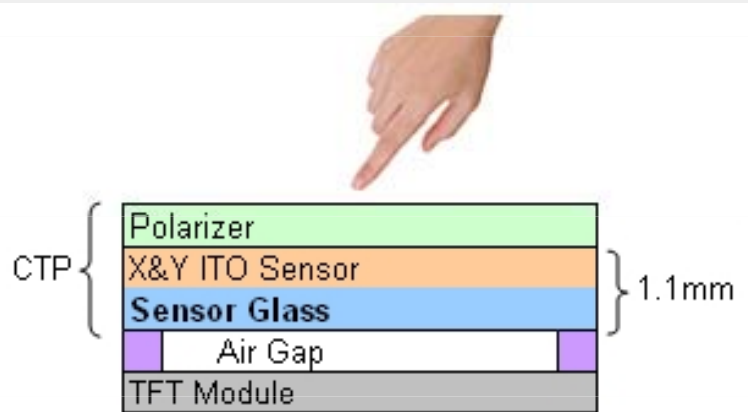
Recommended Application:

- ✓ Smart Phone
- ✓ Ultrabook
- ✓ Tablet



P-Cap Sensor Structure...4

Polarizer + Sensor Glass Stackup



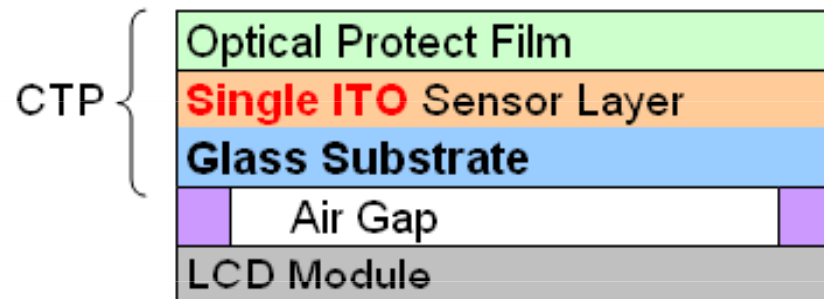
Recommended Application:

- ✓ Automotive
- ✓ Industrial Instrument
- ✓ Home Appliance



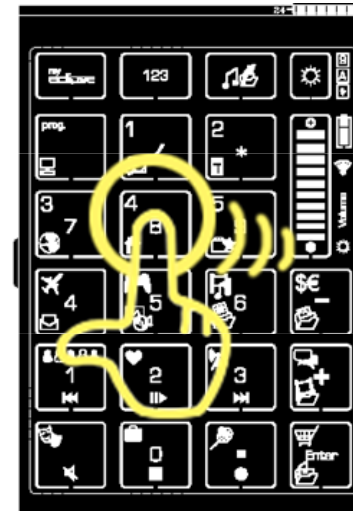
P-Cap Sensor Structure...5

Single Layer Stackup For Touch Key Solution



Recommended Application:

- ✓ Home Appliance
- ✓ Security Equipment



CTP+TFT Air Bond Vs. Full Lamination



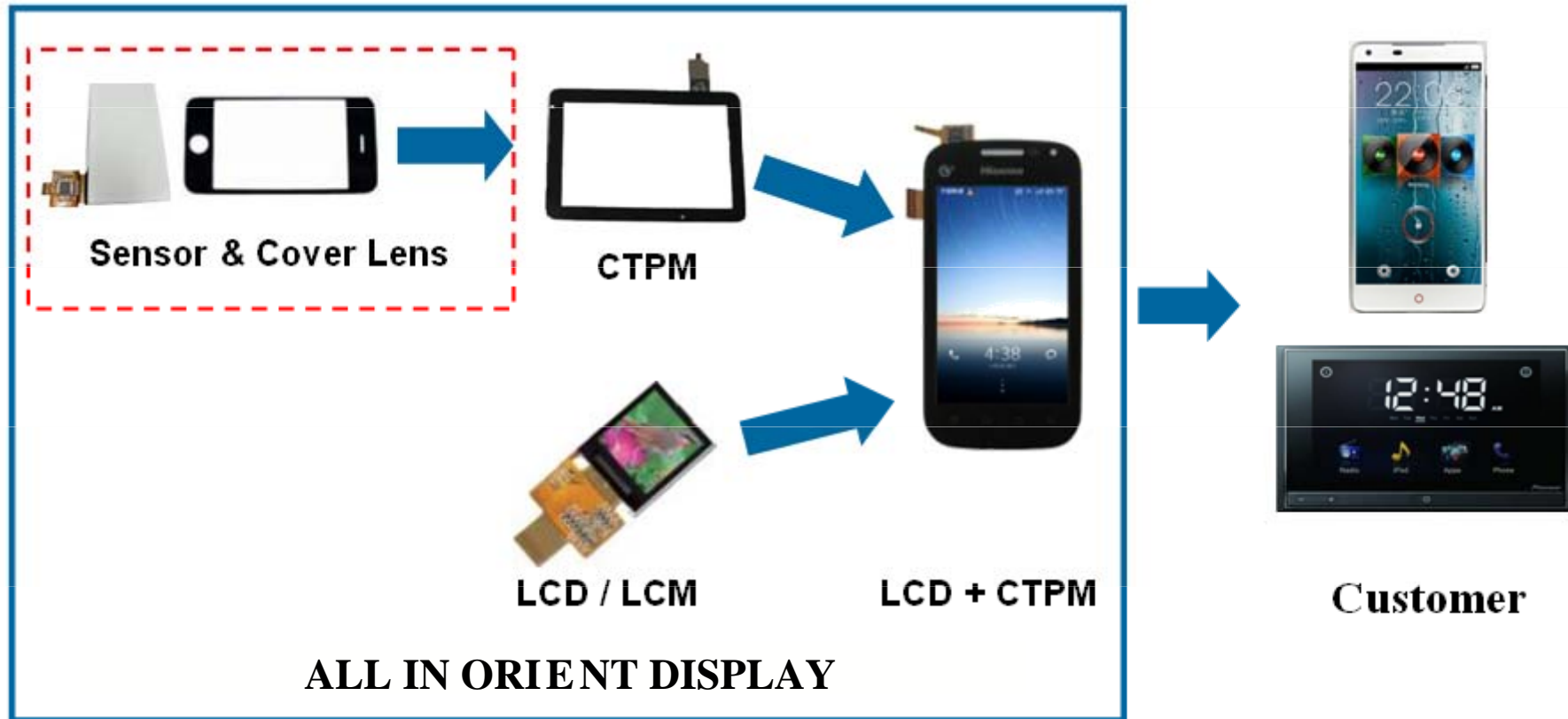
P-Cap Touch Panel's Development Situation

Orient Display CTP's History

- **Oct. 2007** Project to carry out research of multi-touch capacitive touch panel technology.
- **Jan. 2008** Successfully invented the sealed double substrate capacitive touch panel module sample.
- **Mar. 2010** CTP Project put into quantity production and application; Successfully developed the mono On-Cell Touch sample.
- **May 2010** Successfully developed the OGS sample.
- **July 2011** The Sensor line put into production and formed a complete set of Cover Lens, Sensor and lamination assembly.
- **Sept. 2011** The touch module with high-resolution TFT-LCD put into high-volume production.
- **2012** Developed new CTP Production line, grew to China's No.1 CTP manufacturer.
- **2014** Expanded CTP Production with additional new line



Industrial Chain Layout Of Orient Display



- We integrate CTP sensor, Cover lens, CTP module, LCD/LCM, Lamination Unit
 - In-house designed & manufactured —— **One Shop Solution**
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Advanced Equipments & Facilities



Vacuum Coater Line



Exposure



SMT



Vacuum Evaporation Line



Coating



Advanced Test Instrument



Precision Machining

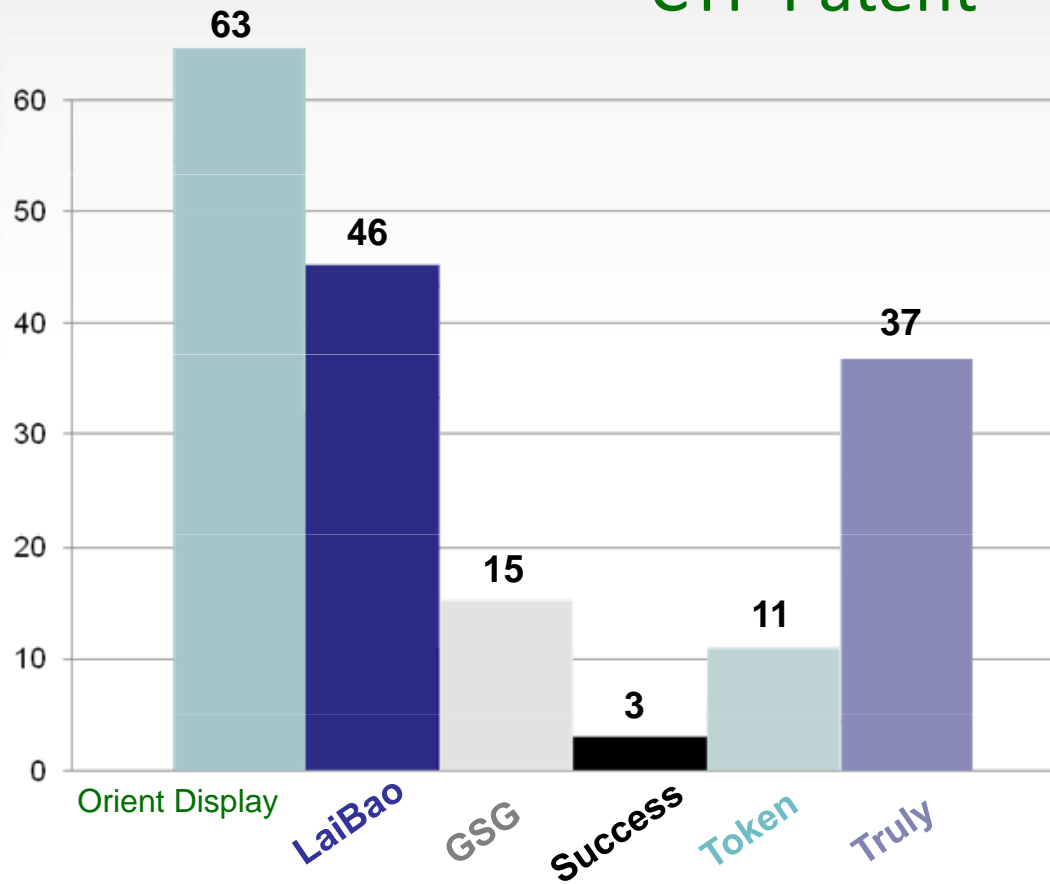


ACF Automatic Attached Line



CTP Patent Layout Of Orient Display

CTP Patent



Our Suppliers

Close relationship with our CTP material suppliers



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Main Applications Of Orient Display Touch Module



Ultrabook



CTP/LCD Inside



Industrial/Automotive/
Home Appliance



Smart Phone/Tablet

Automotive Touch Applications Of P-Cap

❖ Applications Environment :

- Direct Sunlight Dashboard applications
- Interference Sources
(e.g. Power System, LCD Noise, RF Noise, ESD etc.)
- Long-term Vibration
- Wide Operating Temperature Range(-30°C~+85°C)
- Other Harsh Working Conditions

❖ Product Applications:

Center Stack, GPS Navigator , Backseat Entertainment etc.



❖ Assembly Method :

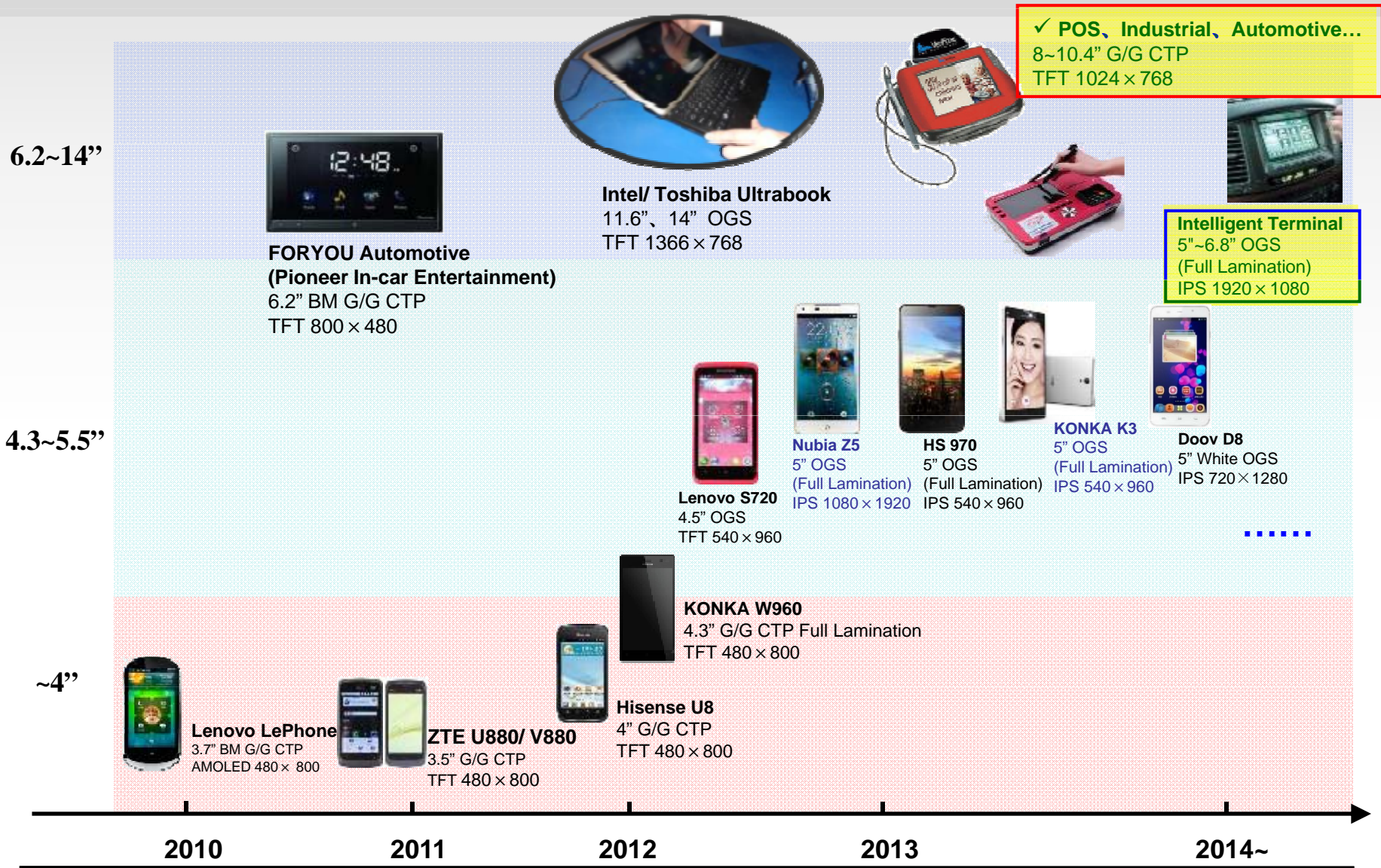
1. Flush Design



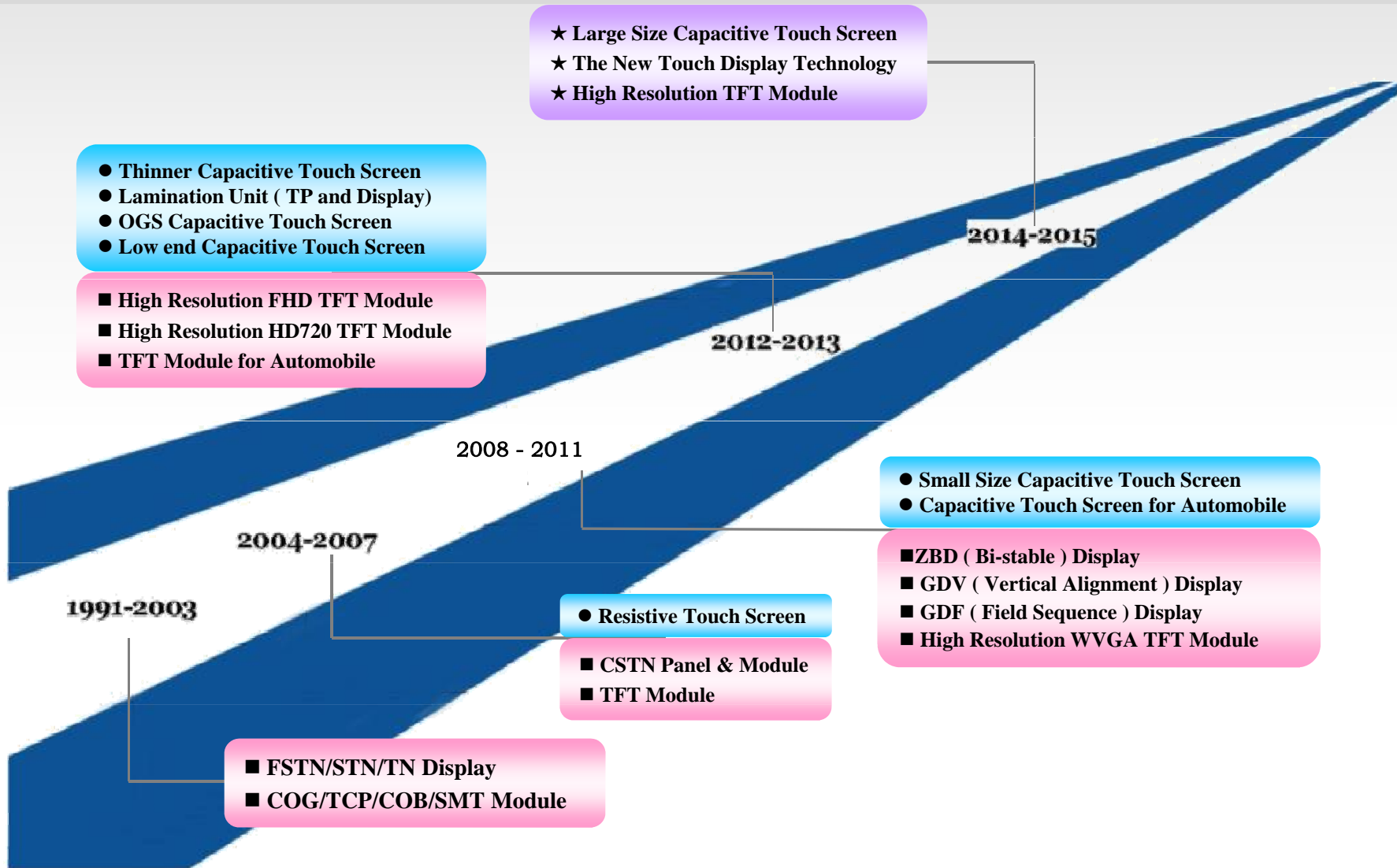
2. Built-in Design



Orient Display Touch Solution Roadmap



Orient Display Technology Roadmap





Thank you for your attention!

