Overcoming Design Challenges with Projected Capacitive Touch Panels

David L. Nolte
Senior Vice President of Engineering

June 6, 2012

Overview

- Projected Capacitive (PCAP) Touch Technology
- Benefits
- Applications
- Challenges
- Overcoming Challenges
- New Technical Developments
- Industry Findings
- About Ocular

© 2011 Ocular. All rights reserved.

Projected Capacitive (PCAP) Touch Technology

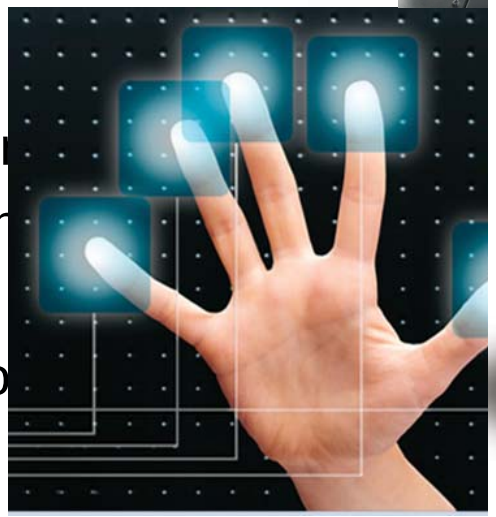
Technology Overview:

- A PCAP touch sensor is an array of electrodes forming capacitive nodes at the intersectio
- The array of electrodes is created on glass substrates with a transparent metal: Indiun Oxide (ITO)
- The interaction with the capacitance and a object is detected and measured by the controller and interpreted into touch inform
- This construction can result in large and ve thin touch sensors

© 2011 Ocular. All rights reserved.

Benefits

- Fast touch response and low latency
- High-signal strength, noise immunity, self ca
  algorithms to prevent false touch events
- Industrial design options that include a flat, z
- A variety of user experiences available
- TRUE Multi-Touch capabilities
- High impact resistance
- Hard, scratch resistant and
- High optical clarity in dema
- Costs in line with performan
- No deformations over time
- Works with hands, gloves o



© 2011 Ocular. All rights reserved.

OCULAR.
DISPLAY YOUR ADVANTAGE

Applications

- Medical Equipment
- Industrial Controls and Instrumentation
- Point of Sale
- Gaming
- Automotive Infotainment
- Marine navigation, charting and sonar equipment
- Security and Access control
- Engineering test equipment
- Building automation, commercial multimedia control systems and high end home automation systems
- Multimedia entertainment systems
- Education
- Work place collaboration
- Meters/Monitoring Systems

© 2011 Ocular. All rights reserved.

OCULAR.
DISPLAY YOUR ADVANTAGE

Challenges with PCAP

- Low manufacturing yields and complex panel construction demanded a high cost premium
  - Demanding design environments requiring large and thin-sized sensors
    - Thin glass
    - Complex manufacturing processes
    - Complex construction inherently reduced yield and increased costs
- Large panels required a controller design with high node count which was complex and expensive
  - Scaling from small to large panels requires high node counts
  - More processing capabilities required by the controller
  - Better noise filtering and control in the design
- Matching panel construction and material requirements to meet the mechanical robustness needed for many industrial and medical applications

© 2011 Ocular. All rights reserved.

Challenges with PCAP

- The mobile phone market has set the design “standard” for touch applications
  - However, the design must change to fit the application
  - Designers must ask the questions of how well does this device:
    - Work in sunlight
    - Work in extreme temperatures
    - Age
    - Survive being dropped
- 3D designs vs. being a 2D component
  - More than just glass
    - Sensor material and construction techniques
    - Thinner sensors produce unique glass challenges
  - Touch design and sensor thickness change based on
    - Sensitivity requirements
    - Cover lens material challenges
    - Customer tuning and environmental requirements

© 2011 Ocular. All rights reserved.

Overcoming PCAP Challenges

Touch Controller Technical Developments

- Controller architecture with increased touch panel node counts:
  - The X-Y matrix intersecting nodes must increase proportionally to the area of the touch panel
  - Required for high resolution and accuracy
  - Mobile phone touch panels could have as few as 50 nodes
  - Large panels such as an 18.5” has ~1700 nodes. A 24” touch panel will require ~2300 nodes
- Increased multi-touch capability
  - Increased concurrent touches from 2 point gestures to 16 and greater TRUE multi-touch capability

© 2011 Ocular. All rights reserved.

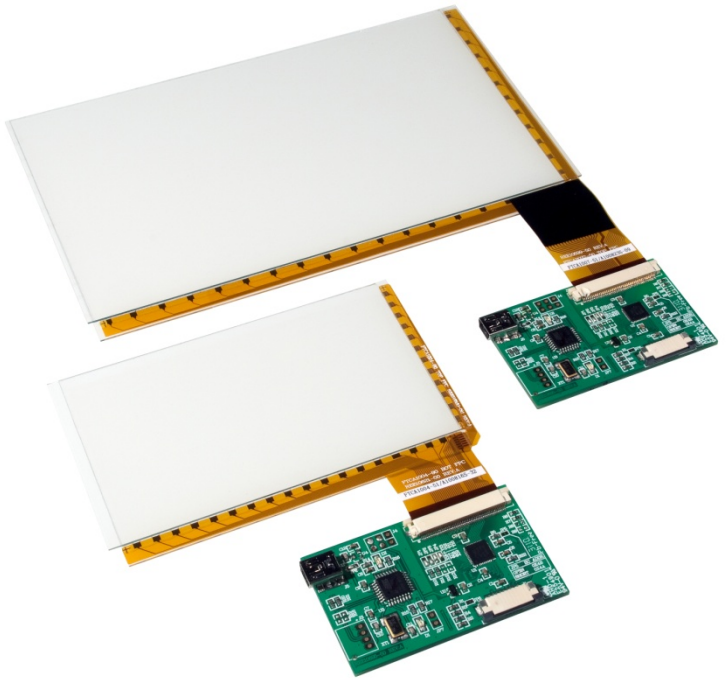
Overcoming PCAP Challenges

- Work with partners to incorporate newer materials and compounds
  - This provides better performing polymers and adhesives that
    - Provide better sunlight visibility and resistance to the damage of UV-rays
    - Withstand thermal extremes
    - Survived shock, vibration and drops
  - Result=products that are more durable and last longer
  - All are benefits of the mobile phone age
- Working closely with customers to development 3D design models
  - Customers understand that a touch sensor is a 3D element both physically and electrically.
  - Design teams better understand challenges and can make better choices
    - Getting involved early in the cycles produces a robust tailored product

© 2011 Ocular. All rights reserved.

Overcoming PCAP Challenges Continued

- Advanced integrated signal processing
  - Digital filtering and noise suppression algorithms
  - Self-calibration and auto-drift compensation
  - Integrated palm suppression
  - Integrated gesture processor
  - Built-in scaling to match LCD resolution
  - Increased response times and reduced late

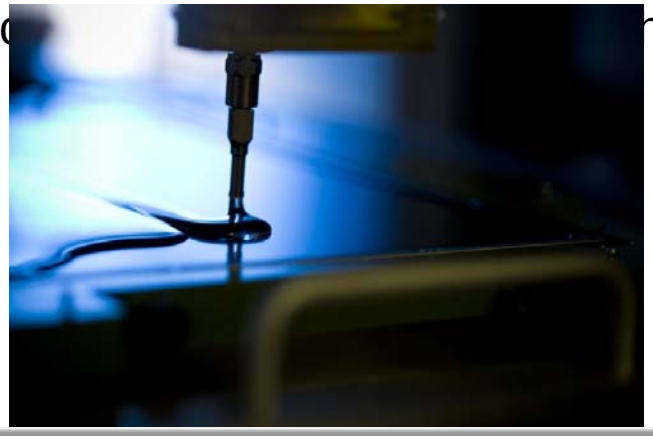


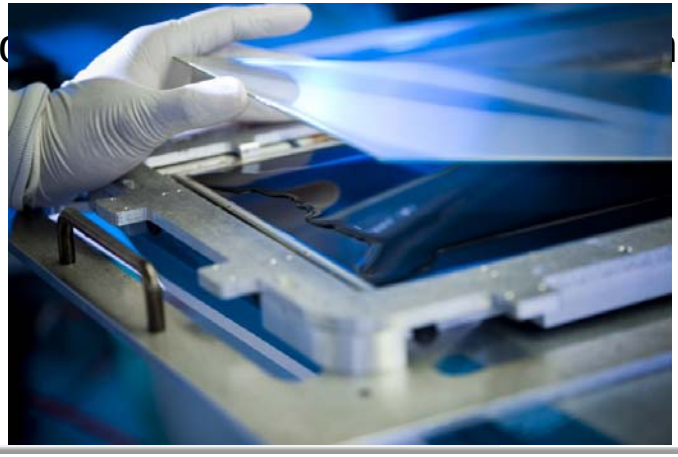
© 2011 Ocular. All rights reserved.

New Technical Developments

Touch Panel-Sensor Technical Developments

- Improved ITO coating to reduce ITO pattern visibility
- New sensor pattern designs that perform a self-shielding function to reduce noise sensitivity
- High performance optical adhesive/dielectric system for glass substrate bonding that eliminate yield loss due to bonding defects i.e. bubbles, non-uniform adhesive layer thickness, etc.
- High performance specialty glasses for improved impact resistance, scratch resistance and safety
- Low c hods fo nects



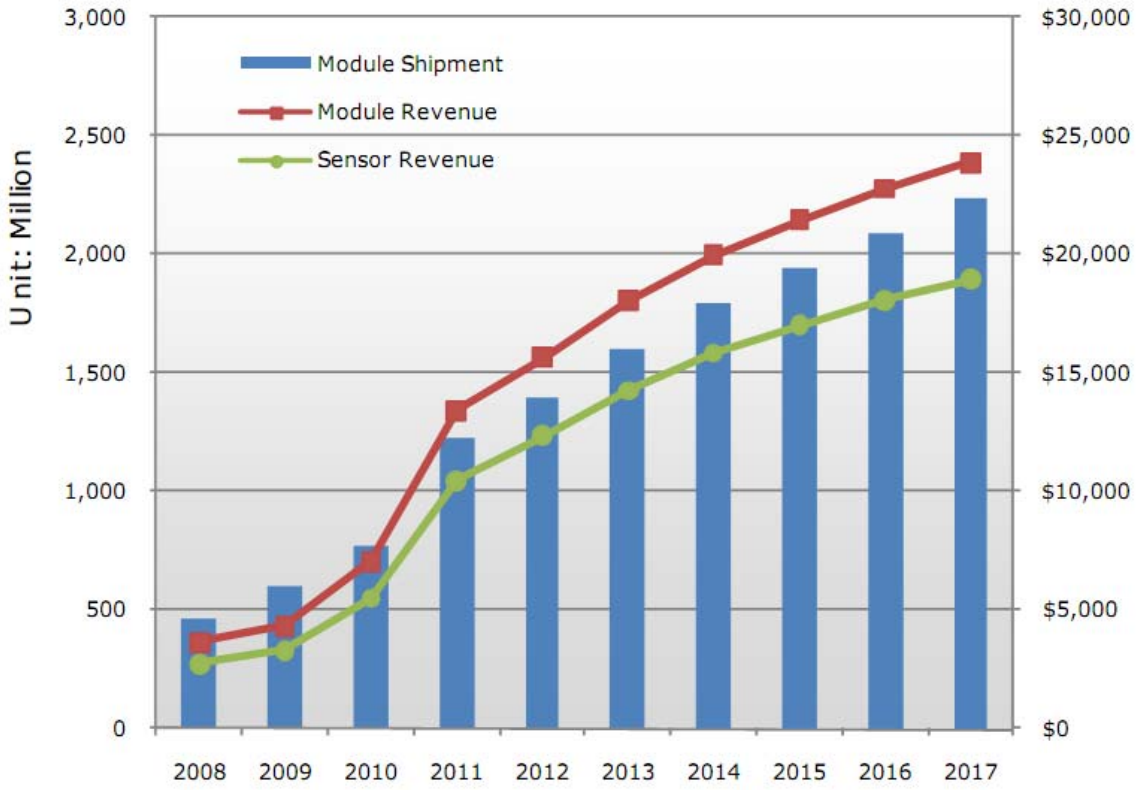


© 2011 Ocular. All rights reserved.

OCULAR.
DISPLAY YOUR ADVANTAGE

Industry Findings

Total Touch Shipments and Revenue



Source: DisplaySearch 2011 *Touch Panel Market Analysis*

© 2011 Ocular. All rights reserved.

OCULAR.
DISPLAY YOUR ADVANTAGE

Industry Outlook

Total Touch Shipments and Revenue

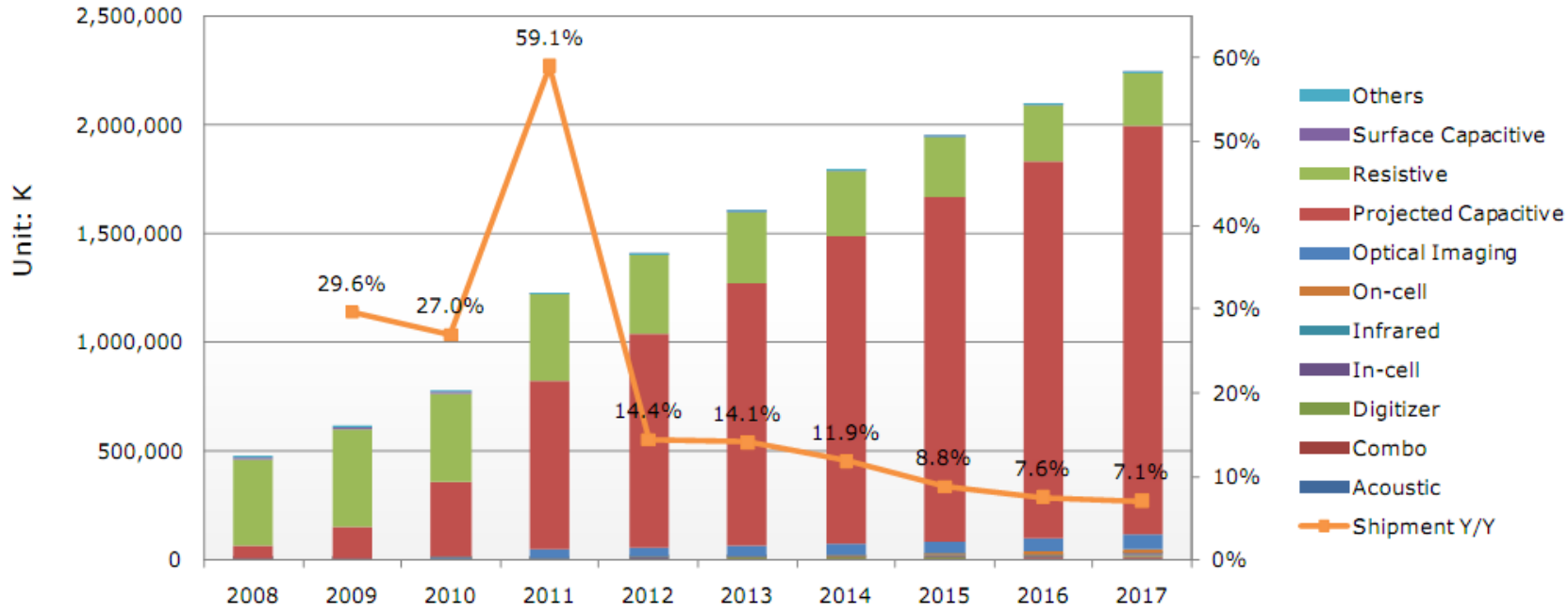
- Total touch module revenue reached $7.1 billion in 2010, up from $4.3 billion in 2009. DisplaySearch forecasts that it will reach $24 billion by 2017.
- Although shipments were up 27% Y/Y in 2010 (a little smaller than 30% in 2009) revenue was up a remarkable 63% Y/Y. DisplaySearch forecasts it will be 90% in 2011, which is higher than the shipment growth forecast.

Source: DisplaySearch 2011 *Touch Panel Market Analysis*

© 2011 Ocular. All rights reserved.

Industry Findings

Touch Module Shipment Forecast By Technology



Source: DisplaySearch 2011 *Touch Panel Market Analysis*

© 2011 Ocular. All rights reserved.

Industry Outlook

Touch Module Shipment Forecast By Technology

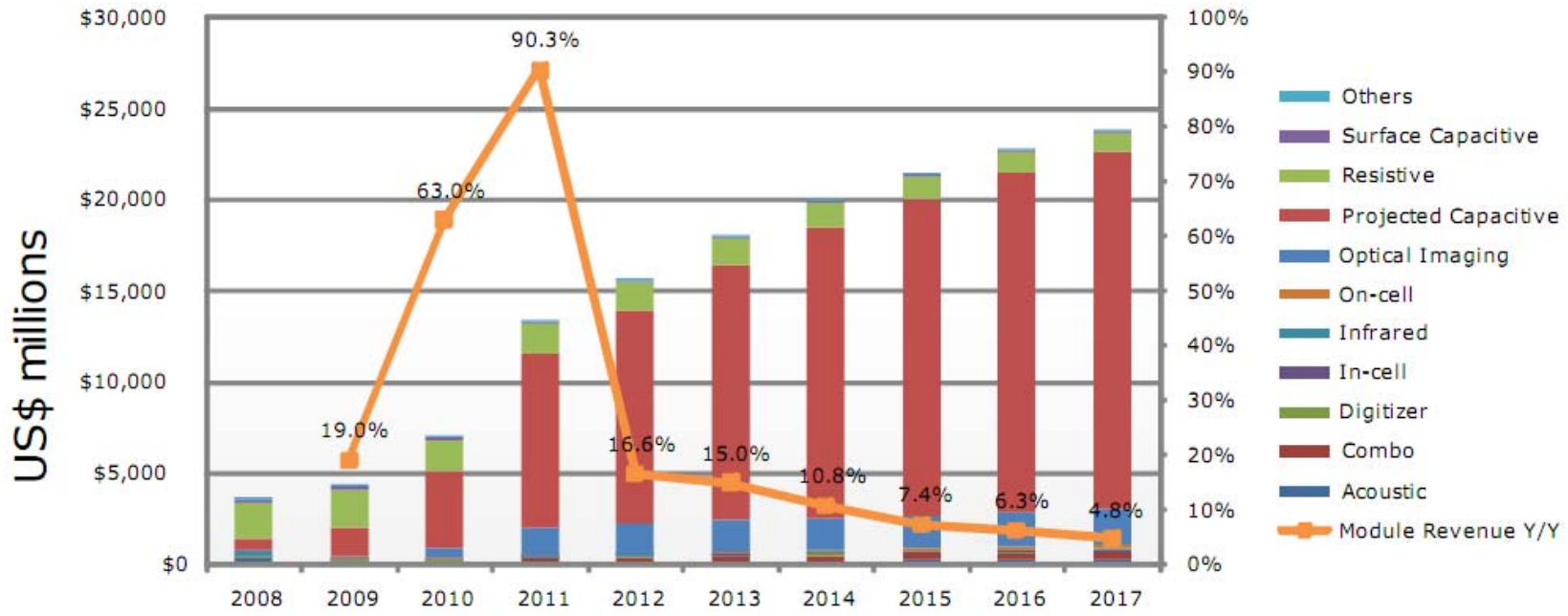
- The definition of a touch module is a touch sensor with a touch controller IC (without a cover lens).
- Total touch module shipments reached 771M in 2010, up from 607M in 2009. We forecast it will reach 2.2 billion by 2017.
- 2011 will have a remarkable 60% Y/Y growth, reaching a peak for many applications.

Source: DisplaySearch 2011 *Touch Panel Market Analysis*

© 2011 Ocular. All rights reserved.

Industry Findings

Touch Revenue Forecast by Technology



Source: DisplaySearch 2011 *Touch Panel Market Analysis*

© 2011 Ocular. All rights reserved.

☐Who is Ocular

We are a Leader in Display Technologies

- Providing **best-in-class** LCD and touch panel products for 25 years
  - **Experts** in display products designed for **extreme environments**
- A leading supplier of projected capacitive touch panel technology
  - Specializing in projected capacitive touch panels with single touch and **TRUE multi-touch functionality**
    The **largest PCAP panel** utilizing Atmel maXTouch™ technology
  - Unique technology advantage with Crystal Touch
    Low-Viz ITO and design robustness
  - Primary supplier to the **market leaders** in POS products
- Strong heritage in **custom display design** and manufacturing
- **Proven experience** in optical bonding technology with DuPont partnership
  - Optical bonding enhances display clarity and durability
  - Ocular utilizes a unique re-workable bonding process

© 2011 Ocular. All rights reserved.

OCULAR.
DISPLAY YOUR ADVANTAGE

OCULAR®

DISPLAY YOUR ADVANTAGE

Thank You!

www.ocularlcd.com | contact@ocularlcd.com

Visit Ocular at
Booth 855
Exhibition June 3-8, 2012