



# Touch Market Overview

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# Scope

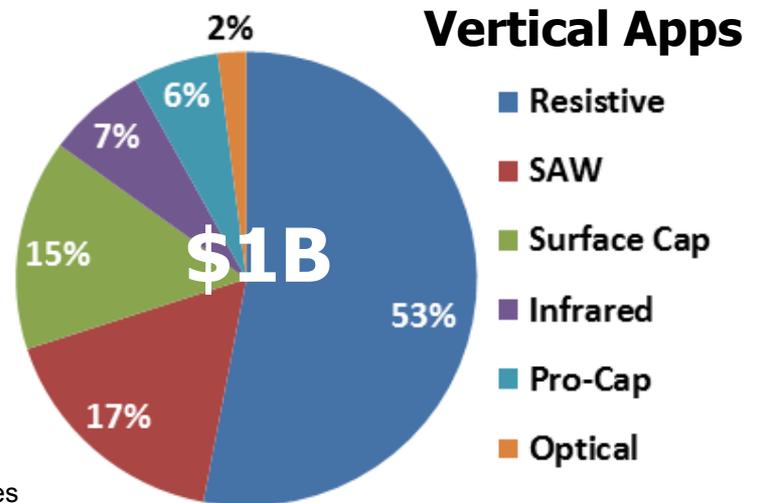
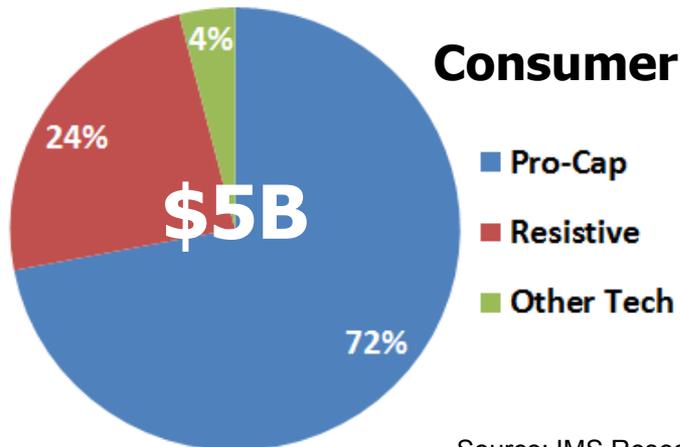
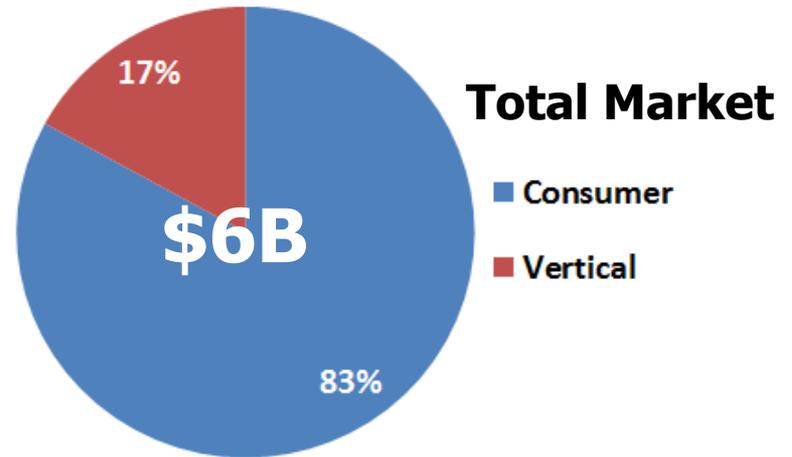
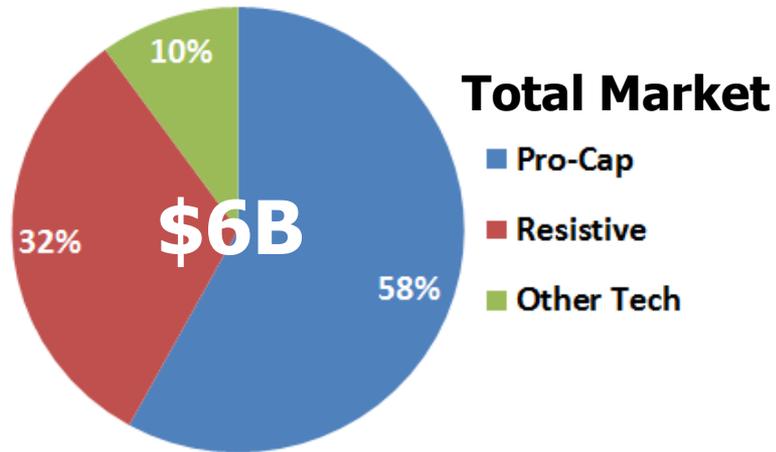
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- ❖ **5-year future view of all 12 of today’s “contact” technologies**
  - ◆ More technology-trend focused than number-focused
  - ◆ Extracted from ***“Touch Technologies & Applications Report”***
- ❖ **Includes all transparent touch market segments**
  - ◆ Interactive opaque whiteboards are excluded
- ❖ **No gesture, motion or voice**
  - ◆ Touch, gesture, motion and voice will all co-exist in cooperative & complementary ways



Source: Vissumo

# 2010 Touch Market Revenue



Source: IMS Research estimates

# Context

## ❖ iPhones, iPad and other products using pro-cap have set the standard for touch in *100s of millions* of consumers' minds

- ◆ Multiple simultaneous touches
- ◆ Extremely light touch
- ◆ Reliable, durable and transparent
- ◆ Flush (bezel-less) surface with off-screen buttons
- ◆ Fully integrated into the user experience – effortless & fun



Source: Apple

# Key Assumption

❖ Since most vertical-application users are also consumers, this “pro-cap standard” is going to migrate from consumer applications into vertical applications

❖ **Current impediments**

- ◆ Sensor cost
- ◆ Integration difficulty
- ◆ Scaling to larger sizes
- ◆ Wider range of requirements



Source: 3M

# Pro-Cap Controllers

## ❖ Latest controllers support stylus with 1-mm tip

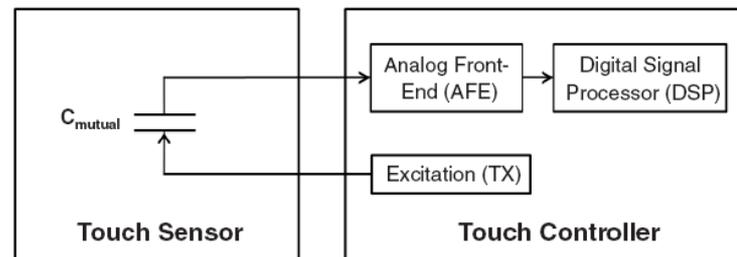
- ◆ Stylus will become common – both active & passive



Source: Atmel

## ❖ Rapid increase in the number of controller suppliers

- ◆ While the top three or four focus on CE, the other 25 can support smaller customers in vertical applications
- ◆ More suppliers = more innovation = more capabilities
- ◆ More suppliers = slower standardization = less commoditization
- ◆ More suppliers = easier integration



Source: Maxim

# Pro-Cap Sensors

- ❖ **Pro-cap cost is driven by the fab cost; a fab is required because of ITO**
- ❖ **ITO-replacement materials are going to eliminate the need for fabs, which will drive down the sensor cost**
  - ◆ It's already started with Cambrios' silver nanowires ("ClearOhm") in Synaptics' touch-screen in the "Cricket" smartphone in Asia
  - ◆ Within five years, as much as 50% of pro-cap sensors will be manufactured using ITO replacements
  - ◆ ITO replacements will also break the scaling barrier



Source: [www.pvd-metallizer.com](http://www.pvd-metallizer.com)

# Pro-Cap Summary

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- ❖ In consumer electronics, pro-cap will totally dominate, cutting analog resistive down to a single-digit market share in five years
- ❖ In vertical applications, pro-cap will grow to 50% market share in five years
  - ◆ See presentations by N-trig, Touch International, Ocular LCD & Motion Computing



Source: Verifone

# LCD On-Cell

- ❖ **“On-cell” locates the pro-cap electrodes on the color-filter glass, under the polarizer**
  - ◆ It's just pro-cap in a different location
  - ◆ The key difference is who's in control of the manufacturing
- ❖ **There are many business & operational issues**
  - ◆ Touch-on-lens, performance, controller integration, CF-glass yield, controller confidentiality, LCD product-line management...
- ❖ **On-cell will account for less than 20% of consumer pro-cap in five years, and much less in vertical applications**



Source: LG Display

# Analog Resistive

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## ❖ Resistive limitations will become an increasing impediment in light of the “pro-cap standard”

- ◆ No multi-touch
- ◆ High touch-force
- ◆ Poor durability
- ◆ Poor optical performance



Source: TabletKiosk

## ❖ The largest pro-cap supplier in the world has a division focused on driving pro-cap into vertical applications, replacing resistive

## ❖ Analog resistive’s share of vertical applications will be cut by more than half in five years

# Analog Multi-Touch Resistive (AMR)

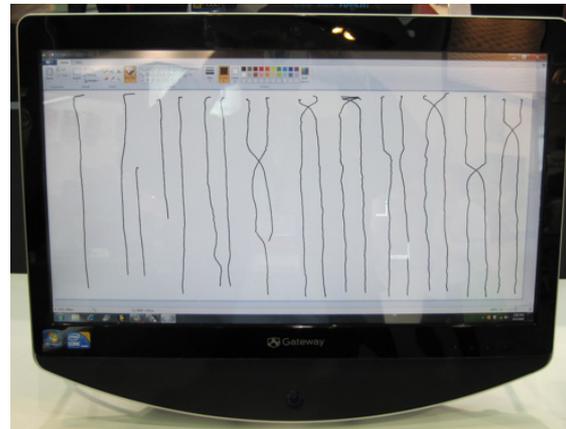
## ❖ It's not getting any traction in consumer electronics

- ◆ Zero in tablets, close to zero in all-in-one desktops

## ❖ It has issues

- ◆ It's not significantly lower cost than pro-cap
- ◆ It's not easy to make properly, especially in larger sizes
- ◆ It has all the same limitations as single-touch resistive

## ❖ It will remain an insignificant niche technology



Source: Photo by author

# Surface Acoustic Wave (SAW)

- ❖ **SAW has a broader range of vertical applications than surface capacitive**

- ◆ More suppliers, more durable, and easier to integrate

- ❖ **SAW will have difficulty competing with pro-cap**

- ◆ Two-touch at most (Elo & General Touch), with more touch-force than pro-cap
- ◆ Difficult to make bezel-less; Elo has done it but has patent protection (sole-source)



Source: Kodak

- ❖ **SAW's market share will drop by 40% in five years**

# Surface Capacitive

## ❖ Main applications are casino games and kiosks

- ◆ Users increasingly will have pro-cap CE products and will therefore have pro-cap touch expectations

## ❖ Application software developers are likely to respond to those expectations

- ◆ This will drive single-touch, moderate-durability surface cap out of those applications
- ◆ Asian surface-cap vendors are already exiting the market because they see the pro-cap wave

## ❖ Surface-cap's market share will be cut in half in five years



Source: 3M

# Large-Format Technologies

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- ❖ **Traditional infrared will lose some share to camera-based optical because of cost**
- ❖ **High-finger-count (20-40) multi-touch infrared will remain a niche technology because there are no applications for it and it's not good for whiteboards**
- ❖ **DST and APR will disappear**
- ❖ **Wire-based pro-cap will disappear when ITO-replacement materials scale to large-format**



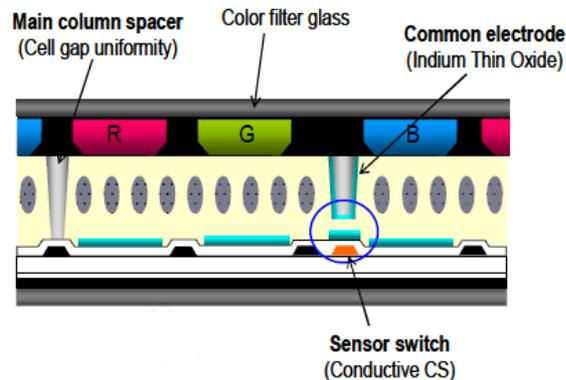
Source: DreamTouch

# LCD In-Cell

❖ “In-cell” locates the touch-sensing elements between an LCD’s two sheets of glass

❖ It’s still in R&D!

◆ Very slow progress



Source: Samsung

❖ Very few products

◆ Samsung-Microsoft SUR40 (light-sensing)

◆ Samsung digital cameras (voltage-sensing + capacitive sensing)

❖ In-cell is unlikely to account for more than 10% of consumer touch in five years

# What's Left

## ❖ **Force-sensing** (*not the same as pressure-sensing*)

- ◆ Difficult to achieve multi-touch and bezel-less
- ◆ It won't achieve critical mass in five years and so will disappear

## ❖ **EMR pen-digitizer**

- ◆ Will survive as a viable niche technology
- ◆ Advantages outweigh disadvantages



Source: Photo by author

## ❖ **Vision-based touch (with contact)**

- ◆ Still in its infancy, but will survive as a viable niche technology

## ❖ **Combinations of touch technologies**

- ◆ Major + minor will become more important

# Conclusions

<b>Touch Technology</b>	<b>5-Year Prediction</b>
Projected Capacitive (ITO-based)	<b>Dominant</b>
Projected Capacitive (wire-based)	<b>Disappear</b>
Analog Resistive	<b>Major Reduction</b>
Analog Multi-Touch Resistive (AMR)	<b>Insignificant Niche</b>
Surface Acoustic Wave (SAW)	<b>Major Reduction</b>
Surface Capacitive	<b>Major Reduction</b>
Traditional Infrared	<b>Reduced Large-Format; Continued Small-Medium</b>
High-Finger-Count Multi-Touch Infrared	<b>Insignificant Niche</b>
Waveguide Infrared (DWT by RPO)	<b>Disappear</b>
Camera-Based Optical	<b>Increased Large-Format; Reduced Desktop</b>
Acoustic Pulse Recognition (APR by Elo)	<b>Disappear</b>
Dispersive Signal Technology (DST by 3M)	<b>Disappear</b>
LCD In-Cell	<b>Limited Success</b>
Force-Sensing	<b>Disappear</b>
Electromagnetic Resonance (EMR) Pen Digitizer	<b>Viable Niche</b>
Vision-Based	<b>Viable Niche</b>
Combinations of Technologies	<b>Major + Minor More Significant</b>



# Thank You!

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