



IDMC 2013

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Status and Future of Touch Technologies

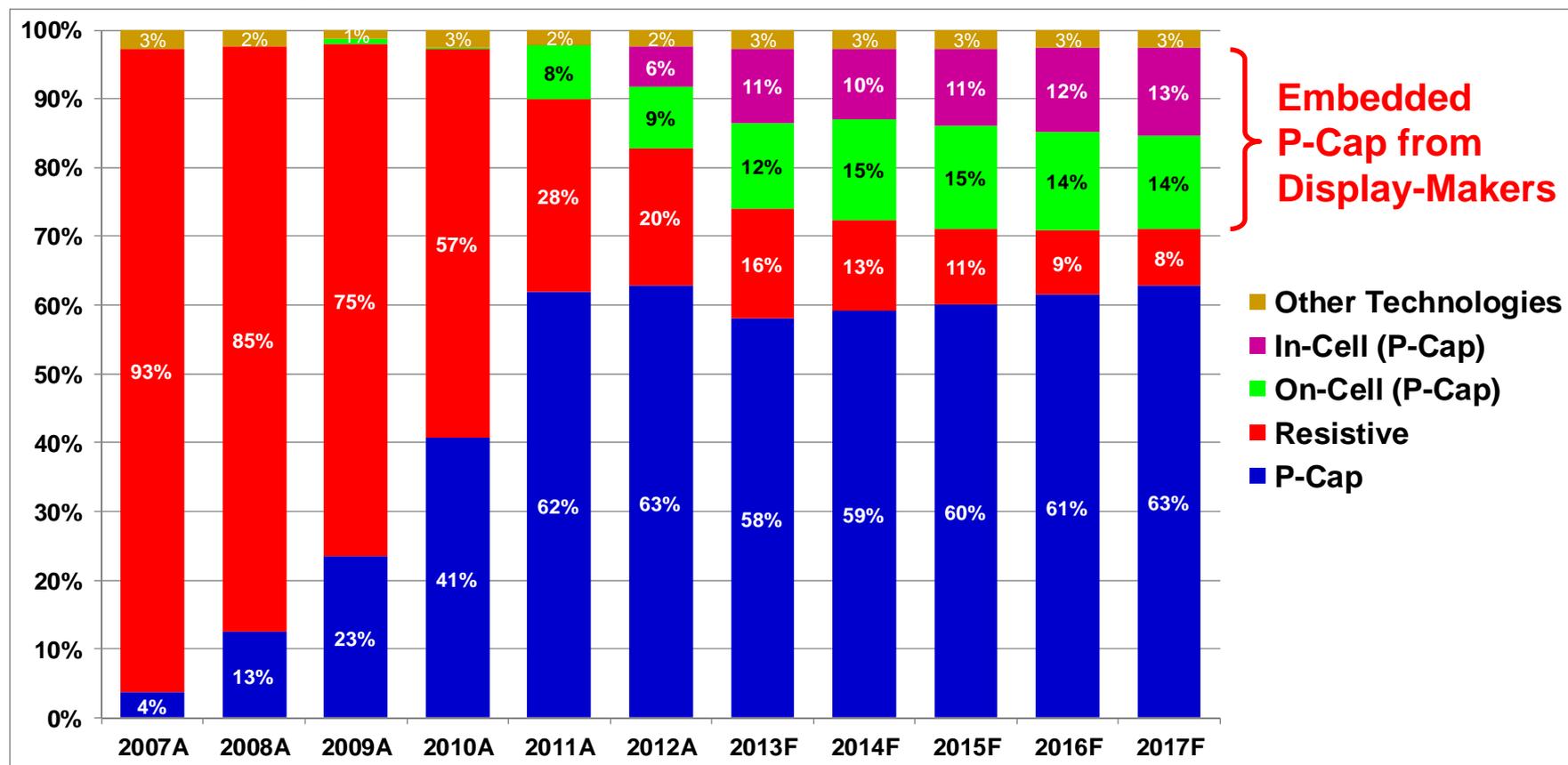
OR

The Touch-Panel Makers Versus The Display-Makers

File Download: www.walkermobile.com/IDMC_2013_Touch_Futures.pdf

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

% of Units Shipped



Source: DisplaySearch Touch-Panel Market Analysis Reports 2008-2013

Embedded Touch Terminology

Term	Integration Method
In-Cell	Touch sensor is physically inside the LCD cell Touch sensor can be: <ul style="list-style-type: none">• Capacitive electrodes (same as p-cap)• Light-sensing elements (rare)
On-Cell	Touch sensor is on top of the color-filter glass (LCD) or the encapsulation glass (OLED) <ul style="list-style-type: none">• Capacitive electrodes (same as p-cap)
Hybrid (In-Cell/On-Cell)	Touch sensor has sense electrodes on top of the color-filter glass <u>and</u> drive electrodes inside the cell <ul style="list-style-type: none">• <u>IPS LCD</u>: Segmented VCOM electrodes on the TFT glass• <u>Non-IPS LCD</u>: Segmented VCOM electrodes on the underside of the color filter glass

Comparison of Discrete (OGS) Touch with Embedded Touch...1

❖ Cost: Is embedded touch really “free”? No!

- ◆ Cover glass, decoration & bonding = same as discrete (OGS)
- ◆ Touch controller
 - No integration = same
 - Linked to TCON for timing control = same (slightly different chip)
 - Integrated with TCON = saves \$1-\$2 in material cost
 - BUT, it adds LCD-specific chip-development cost (amortized NRE)
- ◆ Flex-tail
 - On-cell and hybrid = same
 - In-cell = none if touch controller is COG; saves another \$1-\$2
- ◆ Electrodes
 - Discrete OGS = currently ITO; could move to printed metal-mesh, which could save \$10+ in tablet size (once mesh competition heats up)
 - On-cell = same as discrete ITO
 - Hybrid = only half as much added ITO (little material cost-difference)
 - In-cell = no added ITO

Comparison of Discrete (OGS) Touch with Embedded Touch...2

❖ Performance

- ◆ On-cell = same as discrete or worse (consider Innolux example)
- ◆ Hybrid = same
- ◆ In-cell = worse, but should improve to be same as SNR goes up

❖ Thickness

- ◆ Embedded is typically 100 μm thinner than discrete OGS
- ◆ But the thickness variation between smartphone models with embedded touch is ~1.0 mm due to other features, so 0.1 mm doesn't mean that much to the consumer (it's mostly marketing!)

❖ Weight

- ◆ Embedded = discrete (same number of sheets of glass)

Comparison of Discrete (OGS) Touch with Embedded Touch...3

❖ Power consumption

- ◆ On-cell & hybrid = same as discrete
- ◆ In-cell with integrated touch & TCON = probably lower, but touch power consumption is <5% of LCD power-consumption so the decrease isn't very significant

❖ Off-screen icons

- ◆ Discrete = no problem
- ◆ Embedded = requires additional circuitry

- ❖ **Conclusion: Embedded touch isn't a clear win in either cost or technology; *it's all about who gets the touch revenue!***

Comparison of Discrete (OGS) Touch with Embedded Touch...4

❖ What the device OEM wants

- ◆ An integrated module with display, touch, and unique cover-glass, ready to drop into each model

❖ What the touch-panel makers deliver

- ◆ Increasingly, what the device OEM wants
- ◆ TPK is a good example
 - \$5B revenue in 2012 was \$3B of touch and \$2B of displays
 - TPK spent \$250M in 2011 on cover-glass manufacturing equipment (i.e., vertical integration)

Comparison of Discrete (OGS) Touch with Embedded Touch...5

❖ Display-makers have some problems delivering what the device OEMs want

- ◆ Display-makers would like to ship (for example) 50M identical displays, not 5M each with 10 unique cover-glasses
- ◆ Each 5M displays with a unique cover-glass is a different SKU, which adds product-management cost
 - Not to mention that there's probably a non-touch version of the same LCD (another SKU)!
- ◆ If the display-maker doesn't want to be in the cover-glass business (vertically integrated), outsourcing it adds cost due to the cover-glass maker's margin

Where the Touch-Controller Suppliers Fit In This Battle

- ❖ **It seems clear that neither the touch-panel makers or the display-makers are going to easily beat the other**
 - ◆ Controller suppliers must therefore support both discrete touch and embedded touch, and market to both sides
 - This adds more complex requirements to new controller designs
 - ◆ Most controller suppliers seem agnostic
 - ◆ The exception is Synaptics, who clearly favors embedded touch
 - They even bought a TCON company in order to be able to become expert at integrating the touch controller with the display controller
 - ◆ It remains to be seen which strategy is better...

Conclusions...1

- ❖ **The driving force in embedded touch is the display-makers' need to add value in order to increase their revenue and profitability**
- ❖ **Embedded touch provides little advantage to the end-user (consumer)**
- ❖ **Embedded touch may not provide significant cost-savings to the device OEM, since OGS can be further cost-reduced with metal-mesh**

Conclusions...2

- ❖ It may actually be harder for the display-makers to take advantage of the continuous innovations expected from the major touch-controller suppliers in the next few years
 - ◆ Active stylus support, integration of touch algorithms into the CPU chipset, finger-hover, water-resistance, other touch objects, touch feedback (haptics), decreased latency (faster response), etc.

Conclusions...3

❖ The Bottom Line

- ◆ The display-makers will take some market share with embedded touch in high-volume products (DisplaySearch says 30% in 2017) but embedded touch is unlikely to become dominant because the touch-panel makers simply won't let their business be destroyed
- ◆ **It's going to be a hard-fought WAR**

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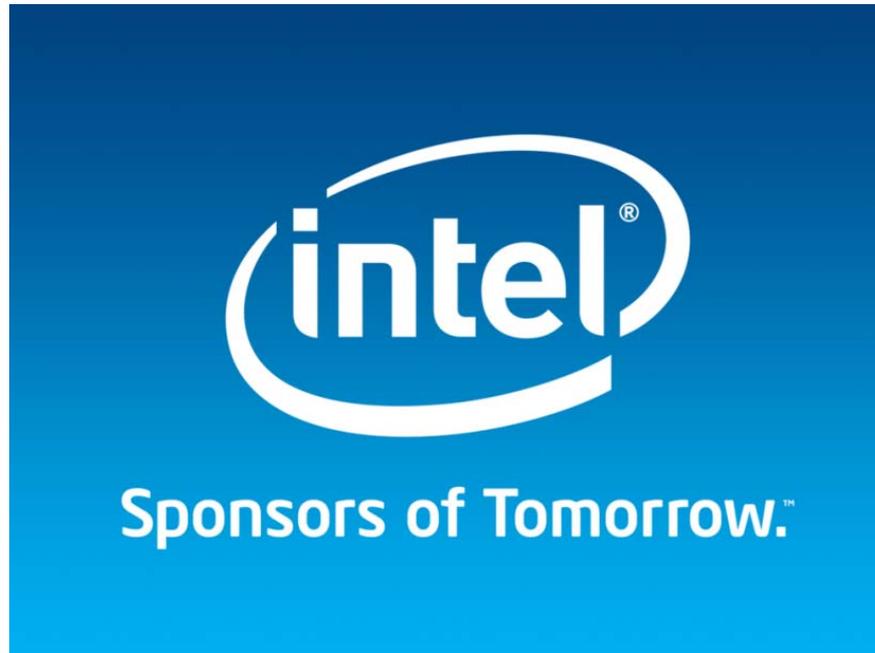
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