KDB Daewoo Securities

Display

Winds of change in the touchscreen industry

Technology

2H13 Outlook
June 3, 2013

Daewoo Securities Co., Ltd.

Display

Jonathan Hwang
+822-768-4140
j.hwang@dwsec.com

Brian Oh
+822-768-4135
brian.oh@dwsec.com

Touchscreen market to grow twofold by 2016

We remain optimistic about the growth of touchscreens for use in smartphones and tablet PCs. This year, we project shipments of smartphones and tablet PCs to reach 1.1bn units (+32% YoY), with shipment area expanding 39% YoY to 8,580km^2. The smartphone- and tablet PC-use touchscreen market is forecast to jump 31% YoY to US$16.4bn, or W18tr. Traditional PC manufacturers are likely to adopt touchscreens full swing starting this year. Indeed, Intel made touchscreens a required specification for all 3rd generation Ultrabooks (to be released this year). We project the touchscreen market to grow at a CAGR of 104% until end-2016, as 40% of laptop computers (89mn units) and 39% of desktop computers (56mn units) are expected to adopt touchscreens.

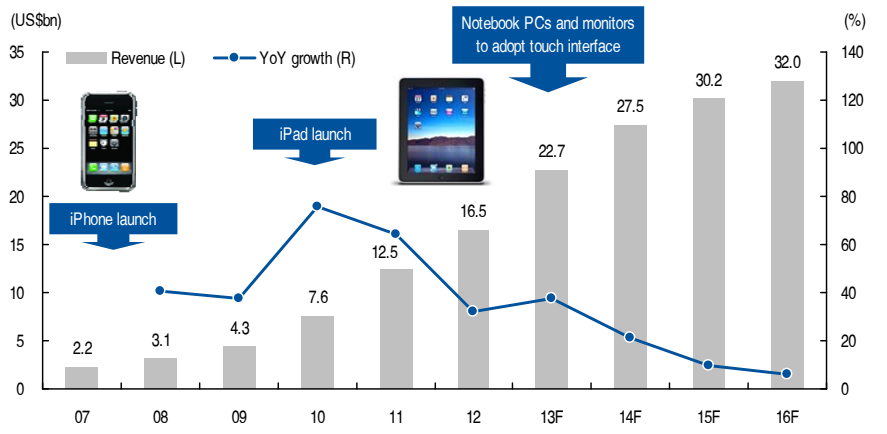
Changing rules: Large players entering the touchscreen market

Up to this point, only small-to-medium enterprises have engaged in the touchscreen business. Touchscreens for smartphones and tablet PCs require customization, as: 1) their cover glass designs are unique, 2) they must feature cutouts for cameras and speakers, and 3) they must accommodate various bezel colors and logos. Indeed, this need to produce multiple items in small volumes made the touchscreen business optimal for small manufacturers. However, the market has recently experienced changes. Large panel makers, as well as LCD color filter producers, are entering the market due to: 1) their desire to find new growth drivers amid the LCD industry slowdown, 2) a surge in 10-inch-or-larger touchscreen demand, and 3) ongoing standardization efforts for touchscreens. In particular, standardization would be positive for big players with large production facilities, since it would enable the mass production of standardized products to bring down cost significantly.

Overweight; Top picks are Samsung SDI, ELK, and Melfas

Although the smartphone- and tablet PC-use touchscreen market is likely to grow, fierce competition should hamper margin improvement. We take note of potential growth for large-sized touchscreens (larger than laptop panels). In addition, we believe PDP lines could be converted to produce touchscreens. We maintain our Overweight rating on the display sector, and select as our top picks Samsung SDI, which is seeing its loss-making units turn around rapidly; ELK, which is a supplier for global PC makers; and Melfas, which is likely to expand its customer base and achieve ASP increases on larger TSPs.

Global touchscreen market



Source: KDB Daewoo Securities Research

CONTENTS

I. Investment thesis

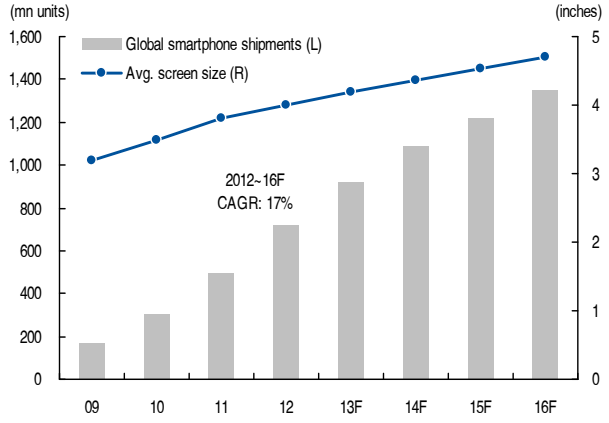
1. Intact growth stories for smartphones and tablet PCs

It has been six years since Apple introduced the iPhone to the world. The revolutionary smartphone sold 5.4mn units in its first year of release and 140mn units last year. Global smartphone shipments continued to flourish last year, growing 46% YoY to 720mn units. Although some are worrying about a potential slowdown, it should be noted that smartphones account for just 40% of the overall mobile phone market. We project the smartphone market to grow at a robust CAGR of 17% until end-2016. And shipment area is forecast to jump 27% YoY in light of the fact that screen sizes are becoming larger.

The tablet PC market is growing even more quickly than the smartphone market. Apple sold 19mn iPads in the device's first year of release and 66mn units last year. We estimate that global tablet PC shipments soared 80% YoY to 130mn units last year. Although recent sluggish iPad sales have triggered concerns over a potential slowdown, we believe that this is an issue specific to the iPad, not the entire tablet PC market. In the smartphone segment, a key competitor for the iPhone (Galaxy S series) emerged three years after the rollout of the revolutionary device. And we note that it has been three years since Apple launched the iPad. Indeed, the market share of the iPad is falling, with low-end Android tablet PCs prospering. We estimate the tablet PC market to grow at a CAGR of 25% until end-2016. Nevertheless, with sales of Android tablet PCs and the iPad mini expanding, average screen size is getting smaller.

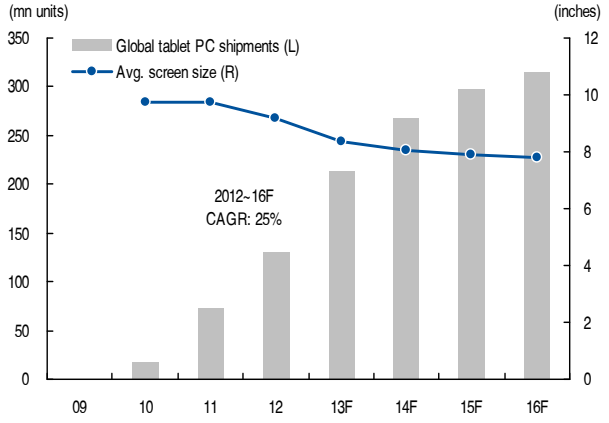
Smartphones and tablet PCs have one thing in common: both devices feature a touchscreen. This year, we project shipments of smartphones and tablet PCs to reach 1.1bn units (+32% YoY), with shipment area expanding 39% YoY to 8,580km^2. The smartphone- and tablet PC-specific touchscreen market is forecast to jump 31% YoY to US$16.4bn, or W18tr. And we project this market to show a CAGR of 14% to reach US$21.3bn (or W24tr) by end-2016. We remain optimistic about the growth of the smartphone- and tablet PC-use touchscreen business.

Figure 1. Global smartphone shipments



Source: KDB Daewoo Securities Research

Figure 2. Global tablet PC shipments



Source: KDB Daewoo Securities Research

2. The "screenager" era: More PCs to adopt touchscreens

The term "screenager" (coined by the futurist Richard Watson in his book *Future Minds*) refers to a young person who is constantly exposed to screens. Screenagers do not understand why the  icon represents the save function in Microsoft Office programs. They are far more familiar with touchscreens than keyboards and mice.

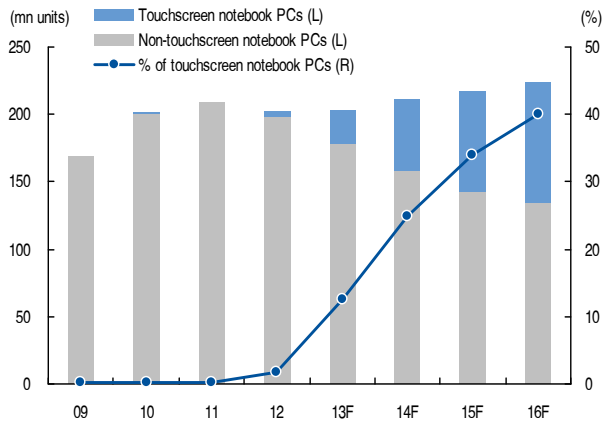
In 1Q13, PC sales volume shrank 14% YoY to 73mn units. With consumers turning to smartphones and tablet PCs, sales of conventional notebook and desktop computers are stagnating. Even the 4Q12 launch of Windows 8 did not revive their sales (the OS was designed to work not just on mobile devices but also on conventional computers). This is partly because only a few conventional computers support the touchscreen interface (Metro UI) of Windows 8. We think that PC OEMs are likely to adopt the touchscreen display in order to protect their market share against tablet PCs and better utilize the interface of Windows 8.

As of end-2012, only 2% and 3% of notebook and desktop computers adopted touchscreens. Given the expected launch of 3rd generation Ultrabook models, as well as the emergence of hybrid PCs and all-in-one PCs, the proportion of PCs featuring touchscreens is likely to soar. We project 13% of notebooks (25mn units) and 14% of desktop computers (20mn units) to adopt touchscreens this year. And the touchscreen market is anticipated to grow at a CAGR of 104% until 2016, as 40% of laptop computers (or 89mn units) and 39% of desktop computers (or 56mn units) are expected to adopt touchscreens in 2016.

However, there remains some skepticism about touchscreens. Some people feel touchscreens are uncomfortable compared to the traditional keyboard-and–mouse setup. However, Intel cleared away much of this skepticism with an experiment that showed that, when provided with Windows 8-based computers, users completed 80% of 50 common tasks via touchscreens. Although touchscreens do have limitations with regard to the execution of delicate work (e.g., graphic design and Excel files), we think that consumers are likely to gravitate toward them, since they are an additional feature, not a replacement, for the traditional keyboard-and–mouse setup.

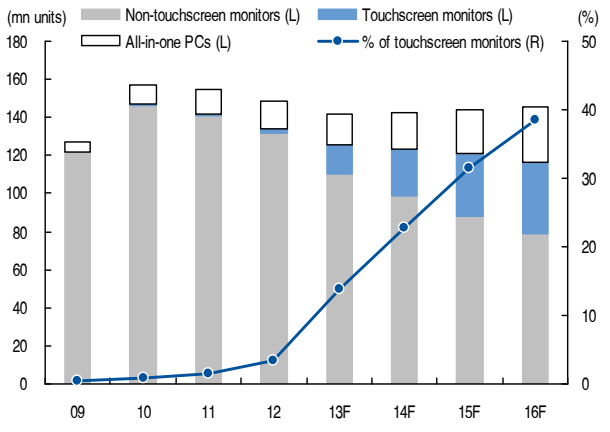
On a negative note, touchscreen adoption is costly. A touchscreen for use in a 13-inch laptop computer costs around US$50. Currently, production of a laptop computer costs US$300-700. Assuming that a touchscreen is adopted in a high-end model (with a production cost of more than US$500), this adoption could increase overall costs by roughly 10%.

Figure 3. Touchscreen penetration in laptop computers



Source: KDB Daewoo Securities Research

Figure 4. Touchscreen penetration in desktop PCs



Source: KDB Daewoo Securities Research

Intel requires all 3rd generation Ultrabooks to have touchscreens

Due to its belief in the efficiency of touchscreens, Intel is requiring laptops (to be released this year) to feature touchscreens in order to be called 3rd generation Ultrabooks. 3rd generation Ultrabooks are expected to adopt the Haswell architecture to cut power consumption by 50% and be as responsive as tablet PCs.

Until end-2012, Ultrabook sales were only tepid. Ultrabook sales volume last year was only 10mn units, accounting for a mere 5% of overall laptop sales. This is largely because most Ultrabook models were priced at above US$1,000. We project prices for Ultrabooks released this year to fall to US$600-800 to compete with tablet PCs. Producers are aiming to achieve combined sales of more than 40mn units this year.

We expect to see PC producers unveil a number of new models at important IT events in June, including Computex in Taiwan (June 4th-8th), Apple's WWDC (June 10th-14th), Samsung Electronics' (SEC) new product launch (June 20th), and Microsoft's BUILD (June 26th-28th). Most PC OEMs are likely to display their 3rd generation Ultrabook models at Computex, while SEC is anticipated to unveil its ATIV Book (a hybrid PC).

Table 1. Specification comparison of Ultrabooks by generation

	First generation	Second generation	Third generation
Code name	Huron River	Chief River	Shark Bay
Release date	October 2011	June 2012	Mid-2013 (June)
Processor	Sandy Bridge (32nm) Intel Core models CULV (17W TDP)	Ivy Bridge (22nm) Intel Core models CULV (17W TDP)	Haswell (22nm) SoC (10 or 15W TDP)
Thickness (max.)	18mm (screen size: ≤ 13.3") 21mm (screen size: ≥ 14.0")	18mm (screen size: ≤ 13.3") 21mm (screen size: ≥ 14.0") 23mm (convertible tablets)	-
Battery life (min.)	5 hours	5 hours	9 hours
Reboot time from sleep mode	within 7 seconds	within 7 seconds	-
Save speed (min.)	-	80MB/s	80MB/s
I/O interface	-	USB 3.0 Thunderbolt	**Touchscreen** Voice/motion recognition sensor
Software	Intel Management Engine 7.1 Intel Anti-Theft Technology Intel Identity Protection	Intel Management Engine 8.0 Intel Anti-Theft Technology Intel Identity Protection	-

Source: Intel

Figure 5. Touchscreen-based Ultrabook

Source: Acer

Figure 6. SEC's ATIV launch event

Source: SEC

3. From customized to standardized touchscreens

Up to this point, only small-to-medium enterprises have engaged in the touchscreen business, with a few exceptions (such as TPK). Smartphone- and tablet PC-specific touchscreens require customization, as: 1) their cover glass designs are unique, 2) they must feature cutouts for cameras and speakers, and 3) they must accommodate various bezel colors and logos. This need to produce multiple items in small volumes made the touchscreen business optimal for small manufacturers.

However, the market has recently experienced changes. Large panel makers, as well as LCD color filter producers, are entering the market due to: 1) their desire to find new growth drivers amid the LCD industry slowdown, 2) a surge in 10-inch-or-larger touchscreen demand, and 3) ongoing standardization attempts.

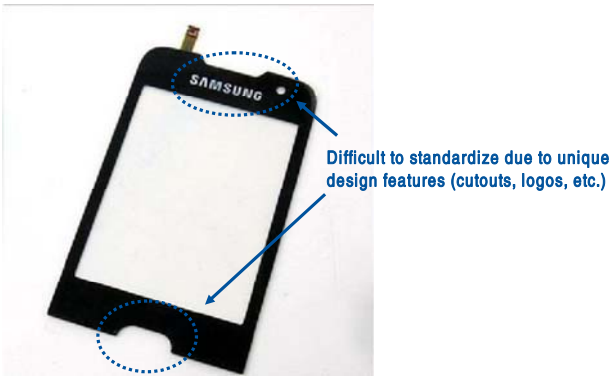
Among display makers, Taiwan-based AUO and Innolux have been the most aggressive in their efforts to convert 4G and 5G lines to produce touchscreens. In particular, as they are converting existing twisted nematic (TN) display lines to produce in-plane switching (IPS) and plane-to-line switching (PLS) panels, their color filter lines have room for additional production. The companies are using this excess capacity to produce touchscreens. LG Display (LGD) is also converting some of its 5G line (capacity of 220,000 units per month) to produce touchscreens.

Indeed, large panel makers are flocking to the touchscreen business, as the laptop-use touchscreen business is likely to grow. Unlike smartphone- and tablet PC-use touchscreens, laptop-use touchscreens can be standardized. Standardization is a favorable change for big players with large production facilities, since it should enable the mass production of a few items.

AUO standardized an embedded touch panel (eTP) by combining a touchscreen and a LCD panel. PC makers are positively responding to this low-priced eTP solution, which is discounted by more than 30% relative to existing solutions. Among panel makers, AUO is taking the most aggressive approach to this business by converting its 3.5G L4Q line (capacity of 50,000 units/month) and 5G L5B line (capacity of 50,000 units/month).

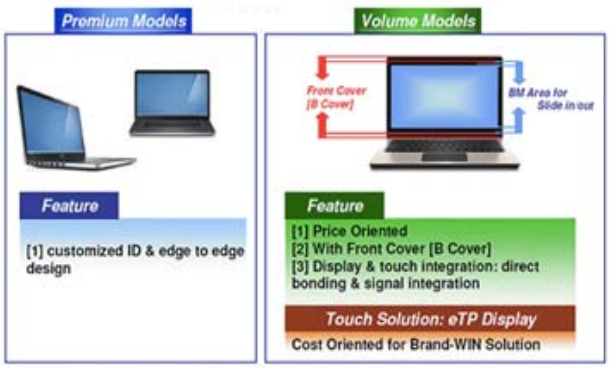
PC makers were reluctant to adopt touchscreens due to: 1) cost burdens, and 2) complicated requirements for Windows 8 (e.g., 20mm bezel between cover and panel). However, as Microsoft has eased these requirements, and panel makers are providing low-end touchscreen solutions, an increasing number of PC makers are expected to adopt touchscreens.

Figure 7. Touchscreen module for mobile device



Source: KDB Daewoo Securities Research

Figure 8. Touchscreen modules for laptops



Source: AUO

Variety of technologies for smartphones/tablets; Standardization for laptops/ monitors

As we mentioned above, the business model of the smartphone- and tablet PC-use touchscreen market differs from that of the laptop- and monitor-use touchscreen market. With regard to smartphones and tablet PCs, a variety of touchscreen technologies will likely coexist, as display makers will need to meet the diverse requirements of their customers. For laptops and PC monitors, we project a standard touchscreen technology to prevail due to the need to cut costs through mass production.

We expect the large-sized touchscreen market (for laptops and monitors) to be dominated by one-glass solution (OGS) technology, which combines cover glass and sensors into a single component. For add-on technology, indium tin oxide (ITO) film technology creates high electrical resistance, which makes it suboptimal for the production of large-sized touchscreen panels. Meanwhile, ITO glass technology is hampered by disadvantages related to thickness and weight. Furthermore, in our view, in-cell and on-cell technologies are still inappropriate for large-sized touchscreens. Therefore, we expect OGS to dominate the large-sized touchscreen market. Among OGS types, the sheet type is likely to take dominance over the cell type, thanks in part to its stronger cost competitiveness.

In 2012, add-on technology was used in 62% of smartphones shipped, while on-cell, in-cell, and OGS accounted for 13%, 8%, and 3%, respectively. The on-cell type was adopted in most of SEC's OLED smartphone models, while the in-cell type was first introduced in the iPhone 5. Going forward, the percentage of add-on adoption is expected to fall steadily, while the figures for OGS and on-cell, which do not require module lamination, should continue to climb.

Table 2. Smartphone touchscreen market breakdown (by technology)

Technology	11	12	13F	14F	15F	16F
Add-on type (GG, G1F, GFF)	70%	62%	49%	39%	32%	27%
In-cell	0%	8%	15%	16%	16%	16%
On-cell	9%	13%	16%	18%	20%	22%
OGS	2%	3%	9%	20%	25%	29%
Other	20%	14%	10%	8%	7%	6%

Source: DisplaySearch, KDB Daewoo Securities Research

As for tablet PCs, the add-on type held the upper hand until last year. Although in-cell, on-cell, and OGS technologies cannot yet be applied to large-sized touchscreen production due to yield issues, we believe that their adoption will steadily rise (as has been the case with smartphones).

Table 3. Tablet PC touchscreen market breakdown (by technology)

Technology	11	12	13F	14F	15F	16F
Add-on type (GG, G1F, GFF)	95%	84%	71%	62%	45%	23%
In-cell	0%	0%	0%	0%	1%	11%
On-cell	0%	5%	12%	16%	22%	30%
OGS	2%	8%	14%	18%	28%	33%
Other	3%	4%	4%	4%	4%	3%

Source: DisplaySearch, KDB Daewoo Securities Research

Add-on technology was used in 52% of laptops shipped last year, while OGS and other technologies (metal mesh etc.) accounted for 12% and 36%, respectively. However, the percentage of OGS, which started to surge this year, is expected to rise to 83% in 2016. As such, OGS should become a dominant technology for large-sized touchscreen panels. In addition, metal mesh technology is likely to win a certain market share, as it has no limitations with regard to the production of large-sized panels thanks to its low electrical resistance.

Table 4. Laptop touchscreen market share breakdown (by technology)

Technology	11	12	13F	14F	15F	16F
Add-on type (GG, G1F, GFF)	54%	52%	11%	4%	2%	2%
In-cell	0%	0%	0%	0%	0%	0%
On-cell	0%	0%	0%	0%	0%	0%
OGS	13%	12%	65%	78%	82%	83%
Other	34%	36%	24%	18%	16%	16%

Source: DisplaySearch, KDB Daewoo Securities Research

4. Potential conversion of PDP lines to touchscreen lines

We are closely watching existing PDP lines, as we believe it is possible that PDP lines will be converted into touchscreen lines (this is our view; Samsung SDI and LG Electronics (LGE) have no official plans to shift their PDP lines as of yet).

PDP sales volume fell more markedly than expected over the past year. Furthermore, Samsung SDI's PDP division posted a significant operating loss of W21bn in 1Q due to LCD makers' aggressive price cuts in the 50-inch (or higher) TV panel market. As such, the price competitiveness of large-sized PDP TVs is gradually dissipating. With Chinese LCD TV makers (including BOE and CSOT) increasing their 30-inch TV panel production, top-tier makers appear to be raising their large-sized TV panel proportions.

Existing PDP lines designated for conversion could probably be best utilized as solar PV lines. However, given that the solar PV market remains in oversupply, the need for such a conversion appears low. The second best way to repurpose existing PDP lines is to convert them to produce touchscreens. Indeed, 1) some deposition, lithography, and etching equipment can be used for both PDP and touchscreen production; and 2) the offset printing process used at PDP lines is similar to the electrode printing process of touchscreen lines.

Although LCD panel makers are converting some of their color filter lines to touchscreen lines, their LCD capacity utilization remain high. However, as the utilization ratios of PDP lines are falling more sharply than anticipated, it is time to consider other ways to utilize PDP lines in the medium to long term.

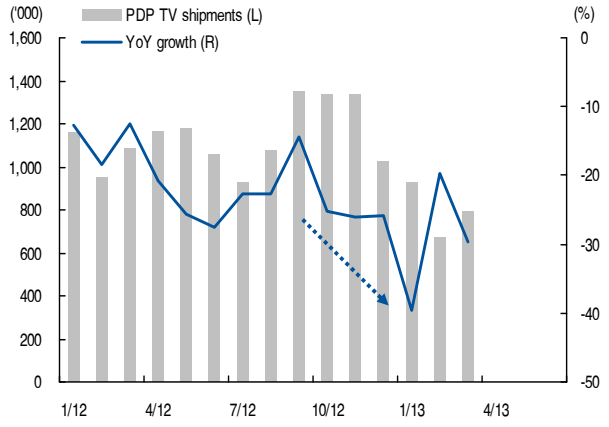
If Samsung SDI's Line 1 (5G; 35,000 glass units/month) is converted into a touchscreen line, it would generate annual revenue of US$320mn (W350bn), based on our laptop-use 14-inch OGS touchscreen panel price assumption of US$50. If Samsung SDI converts all of its PDP lines currently in operation into touchscreen lines, related annual revenue would reach US$2.5bn (W2.8tr). In the event that LGE's A2 line (5G; 50,000 glass units/month) is converted, related annual revenue would be estimated at US$450mn (W500bn).

Table 5. PDP panel capacity in Korea ('000 sheets/month)

Company	Line	MG size	1Q11	2Q11	3Q11	4Q11	1Q12	2Q12	3Q12	4Q12	1Q13	2Q13F	3Q13F	4Q13F
Samsung SDI	Cheonan no. 1	1164 x 1443	35	35	35	35	35	35	35	35	35	35	35	35
	Cheonan no. 2	1155 x 1746												
	Cheonan no. 3	1964 x 2013	55	55	55	55	55	55	50	50	50	50	50	50
	Busan no. 4	2310 x 2328	41	41	35	35	35	33	30	30	30	30	30	30
LGE	A1	1050 x 1164												
	A2	1140 x 1916	50	50	50	50	50	50	30					
	A3	2200 x 2400	50	50	50	50	50	50	50	50	50	50	50	50

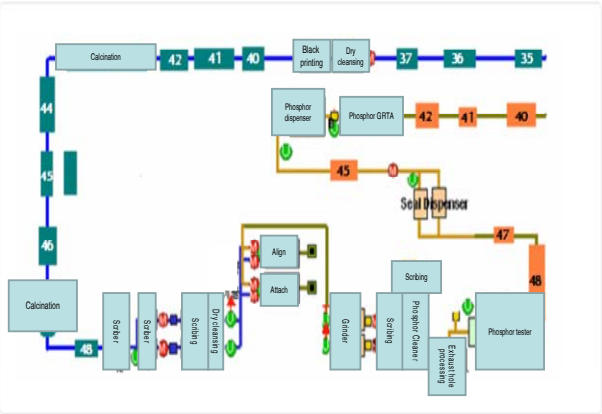
Source: DisplaySearch

Figure 9. Global PDP TV shipments



Source: DisplayBank

Figure 10. PDP panel production line



Source: Dynamic Soft

II. Touchscreen market outlook

1. Demand forecast

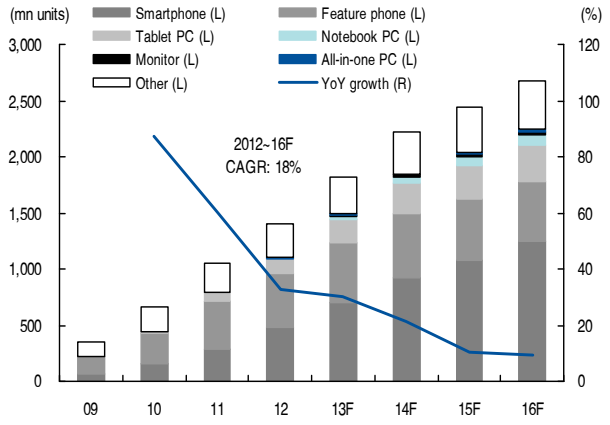
In 2013, we expect the touchscreen market to expand by 38% YoY to US$22.7bn (W25tr). The smartphone-use touchscreen market will likely expand to US$9.5bn (W11tr; +24% YoY), accounting for 42% of the total touchscreen market, while the tablet PC-use touchscreen market should reach US$6.9bn (W8tr, up 43% YoY), or 30% of the market.

We project shipments of smartphone- and tablet-PC-use touchscreens to continue to grow markedly next year. The combined share of laptop-, monitor-, and all-in-one PC-use touchscreens, which stood at less than 5% of the overall touchscreen market last year, will likely rise to 13% this year. PC makers are increasingly adopting touchscreens in their new models this year, as Windows 8, which was launched last year, is based on a touchscreen interface.

The percentage of laptops adopting touchscreens will likely climb from around 2% in 2012 to 13% in 2013. In 2016, we expect the percentage to reach 40%. For all-in-one PCs and PC monitors, the touchscreen percentage will likely rise from 3% in 2012 to 14% in 2013.

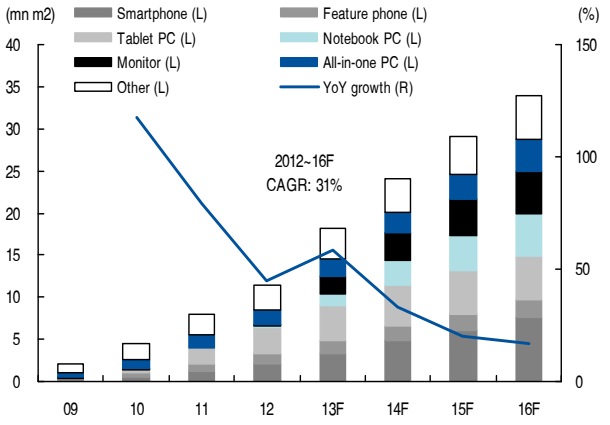
We forecast touchscreen shipment area to increase at a CAGR of 31% from 2012 to 2016, and the touchscreen market to expand at a CAGR of 18% to US$32bn (W36tr) during the same period, backed by both existing mobile products and new applications.

Figure 11. Touchscreen shipments



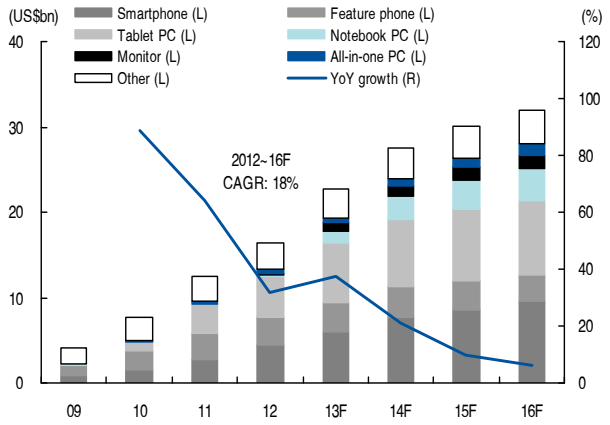
Source: KDB Daewoo Securities Research

Figure 12. Touchscreen shipment area



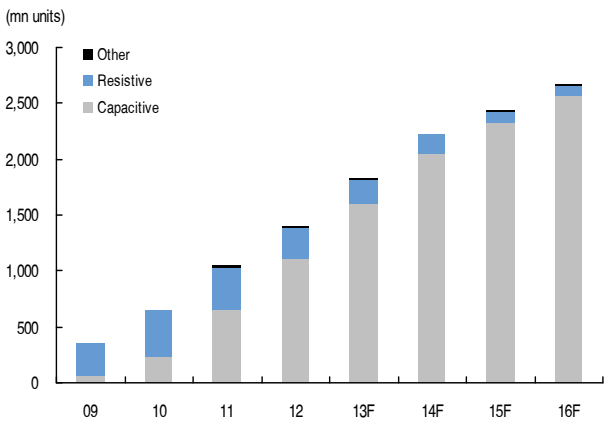
Source: KDB Daewoo Securities Research

Figure 13. Touchscreen market trends and forecasts



Source: KDB Daewoo Securities Research

Figure 14. Touchscreen shipments by technology



Source: KDB Daewoo Securities Research

Touchscreen market to double by 2016

We expect the percentage of touchscreen adoption in smartphones to rise from 76% in 2013 to 93% in 2016. The combined smartphone and tablet PC market will likely expand at a CAGR of 14% from 2013 to 2016.

We project the percentage of touchscreen adoption in laptops to climb from 13% in 2013 to 40% in 2016. For desktop PCs, the percentage of touchscreen adoption will likely increase from 14% in 2013 to 39% in 2016. The combined notebook and desktop PC touchscreen market should expand at a CAGR of 72% to US$6.8bn (W8tr) during the same period.

Table 6. Touchscreen market forecasts and key assumptions

	Application	09	10	11	12	13F	14F	15F	16F
Touchscreen penetration (%)	Handset	16	27	42	55	67	78	82	87
	Smartphone	39	50	59	67	76	85	89	93
	Feature phone	13	21	35	47	58	69	72	75
	Tablet PC	-	100	100	100	100	100	100	100
	Notebook PC	0	0	0	2	13	25	34	40
	Desktop PC	0	1	2	3	14	23	31	39
	Monitor	0	0	0	2	13	20	27	32
	All-in-one	4	10	16	18	23	40	55	65
Shipments (mn units)	Handset	219	423	719	961	1,230	1,496	1,628	1,785
	Smartphone	68	152	292	483	697	925	1,082	1,252
	Feature phone	152	271	427	478	533	571	546	534
	Tablet PC	-	18	73	130	214	267	297	315
	Notebook PC	0	0	1	3	25	53	74	89
	Desktop PC	0	1	2	5	20	32	45	56
	Monitor	0	0	0	2	16	25	33	37
	All-in-one	0	1	2	3	4	8	13	19
	Other	131	214	258	299	335	369	398	426
	Total	351	657	1,053	1,399	1,824	2,217	2,443	2,672
	YoY growth (%)		*87*	*60*	*33*	*30*	*22*	*10*	*9*
ASP (US$/unit)	Handset	10	9	8	8	8	8	7	7
	Smartphone	12	11	10	9	9	8	8	8
	Feature phone	9	8	7	7	6	6	6	6
	Tablet PC	-	54	45	37	32	29	28	28
	Notebook PC	96	94	90	69	57	52	47	42
	Desktop PC	96	94	90	69	62	52	45	41
	Monitor	96	94	90	69	62	54	48	43
	All-in-one	163	158	150	144	118	96	83	75
	Other	14	12	11	11	10	10	9	9
	Total	**11.5**	**11.6**	**11.9**	**11.8**	**12.4**	**12.4**	**12.3**	**12.0**
	YoY growth (%)		*1*	*2*	*-1*	*6*	*0*	*0*	*-3*
Revenue (US$mn)	Handset	2,125	3,750	5,877	7,663	9,484	11,238	11,891	12,644
	Smartphone	792	1,606	2,801	4,399	6,027	7,685	8,627	9,581
	Feature phone	1,333	2,144	3,076	3,265	3,457	3,553	3,264	3,063
	Tablet PC	-	953	3,275	4,820	6,889	7,823	8,439	8,682
	Notebook PC	34	42	47	237	1,441	2,744	3,459	3,773
	Desktop PC	58	189	349	535	1,428	2,060	2,601	2,999
	Monitor	25	30	32	157	976	1,333	1,552	1,593
	All-in-one	33	159	317	378	452	726	1,049	1,405
	Other	1,812	2,678	2,940	3,232	3,439	3,632	3,766	3,868
	Total	**4,029**	**7,612**	**12,488**	**16,488**	**22,681**	**27,497**	**30,156**	**31,965**
	YoY growth (%)		*89*	*64*	*32*	*38*	*21*	*10*	*6*

Source: KDB Daewoo Securities Research

2. Supply forecast

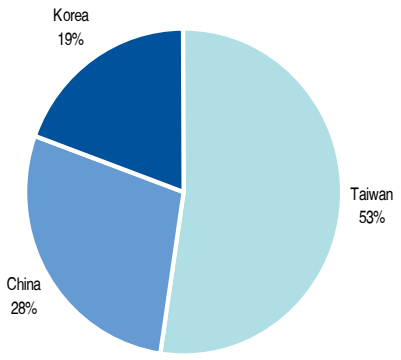
The touchscreen industry is currently being driven by Taiwanese and Chinese makers, including TPK which boasts outstanding productivity and yields. Since there are so many touchscreen makers around the world, it is difficult to estimate global touchscreen capacity. However, an analysis of major touchscreen makers' capacity should prove illuminating. Currently, Taiwanese makers account for 52% of small- and mid-sized touchscreen capacity, while Chinese and Korean makers take up 28% and 20%, respectively. Meanwhile, for large-sized touchscreen capacity, Taiwanese makers control 71%, while Chinese and Korean makers account for only 20% and 9%, respectively. The marked difference in capacity between Taiwanese and Korean makers is attributable to technological differences. Taiwanese touchscreen makers have grown based on glass patterning technology, while Korean makers have mainly produced thin-film touchscreen panels. In particular, it is difficult to produce large-sized touchscreens with thin-film technology due to issues related to: 1) increased ITO resistance and 2) higher costs.

Table 7. Global touchscreen capacity (as of the end-1Q13) ('000/month)

Nation	Company	Small- to mid-sized (4")	Large-sized (10")	Comments
Taiwan	TPK	12,300	5,600	- Currently operating 2-4.5G lines - Preparing 5.5G (Pingtan) lines
	Wintek	16,500	6,000	- Currently operate 2-4G lines
	Cando	2,950	2,100	- TPK holds 20% stake
	HannsTouch	6,720	3,500	- Converted C/F lines - Samsung Display's on-cell OLED - Wintek's notebook PC OGS
	CPT	9,450	600	- Converted C/F lines - Samsung Display's on-cell OLED
	Innolux	1,575	2,640	- GG, sheet G2 (OGS)
	AUO	210	1,410	- Cell, sheet G2 (OGS)
	Total	**49,705**	**21,850**	
China	Laibao	3,500	500	- Preparing 5G OGS
	Truly	7,300	1,800	- Film, glass, OGS
	O-Film	12,000	3,500	- Vertically integrated from cover glass to module assembly
	Wuhu	2,000	300	- Supplies to TPK, Truly, Tianma, EELY
	Goworld	2,000	0	- Cell G2 (OGS)
	Total	**26,800**	**6,100**	
Korea	Iljin Display	2,000	2,000	- Currently producing GFF - Second fab to increase capacity
	ELK	7,000	400	- Currently producing GFF - Expected to produce large-sized OGS in 2H13
	S-MAC	4,000	400	- Internalizing sensors by investing in photo equipment
	Melfas	5,000	0	- Currently producing G1F
	Tovis	500	0	- Cell G2 (Sony Xperia Z)
	Total	**18,500**	**2,800**	

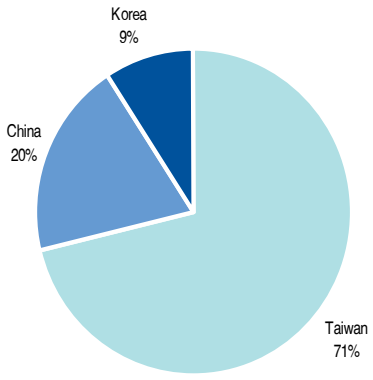
Source: KDB Daewoo Securities Research

Figure 15. Small- to mid-sized touchscreen supply by nation



Source: KDB Daewoo Securities Research

Figure 16. Large-sized touchscreen supply by nation



Source: KDB Daewoo Securities Research

III. Touchscreen panel technology analysis

1. Technology comparison and analysis

In this report, we will focus on the two major types of touchscreens: resistive and capacitive. Resistive touchscreens prevailed until the release of the first iPhone in 2007, but capacitive touchscreens soon became mainstream because of their superior sensitivity and durability, as well as their multi-touch support.

Capacitive touchscreens can be further divided into surface and projected types, but projected capacitive products (PCAP), which are equipped with ITO glass, plastic film, or integrated ITO, are mostly used these days.

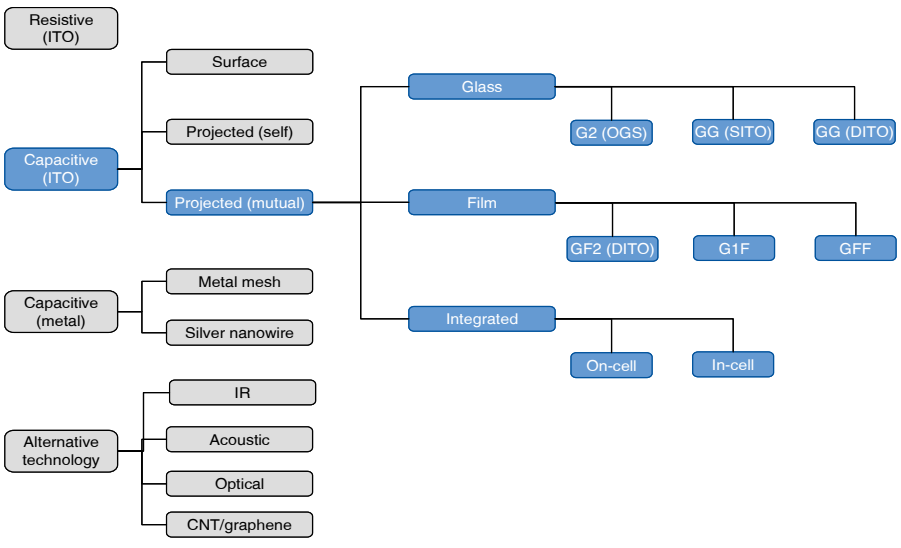
For smartphones, film-based PCAP is the mainstream technology, but usage of the integrated and G2 (pattern-on-glass) types is on the rise. Notebooks and monitors mostly use glass-type PCAP (OGS for notebooks, and metal mesh for all-in-one PC monitors).

Table 8. Comparison of touchscreen technologies

Technology	Type	Smartphone (2-6")	Tablet PC (7-11")	Notebook PC (11-15")	PC monitor (17-24")	Other
Resistive	Analog/digital	Low-end	Low-end			POS, industrial
PCAP (ITO)	Glass (G2, GG)	G2 is growing	GG: iPad	G2: Mainstream	GG: Mainstream	
	Film (GF2, G1F, GFF)	Majority	GF2: iPad mini G1F: MS Surface GFF: Galaxy Tab			
	Integrated (on-/in-cell)	On-cell: OLED In-cell: iPhone 5				
PCAP (metal)	Metal mesh			Partially adopted	Growing	
	Silver nanowire				Adopted partially	
Alternative technology	Infrared (IR)		eBook(Kindle)			Large-sized DID
	Acoustic				Adopted partially	Kiosk, Casino
	Optical				Adopted partially	Large-sized Suface
	CNT/graphene					Flexible

Source: KDB Daewoo Securities Research

Figure 17. Touchscreen technology



Source: KDB Daewoo Securities Research

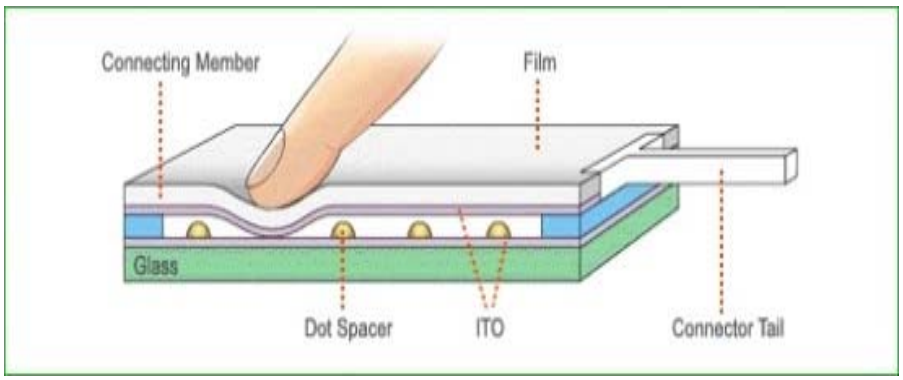
Resistive – 1) analog or 2) digital

When pressure is applied to a resistive touchscreen, two ITO-coated layers, which are located 5-10μm apart from one another, make contact and enable currents to flow. The controller IC determines the exact location of the contact point based on changes in voltage.

Resistive touchscreens are cheap to make, and objects such as pens can be used to apply pressure (in addition to fingertips). However, their durability and transmittance levels are low. Tempered glass—which improves durability—is not suitable for use in resistive touchscreens, and, thus, related demand is anticipated to weaken gradually.

Analog and digital resistive touchscreens are similar in terms of resistive structure, but the digital type differs from the analog type in that it uses ITO stripes for sampling. Resistive touchscreens are used in some low-end feature phones and navigation systems, and demand is high from point-of-sale terminals and certain industrial applications.

Figure 18. Resistive touchscreen



Source: DisplaySearch

Capacitive – 1) surface or 2) projected

Capacitive touchscreen technology: 1) stores electric charges and 2) cuts off direct current to allow alternative current to flow through. A cap sensor installed on the touchscreen senses human body capacitance by measuring changes in electric field.

Unlike resistive touchscreens, which require physical pressure, capacitive touchscreens can measure changes in capacitance from a distance. As such, glass screens can be used. Most mobile devices adopt tempered glass these days due to its high scratch resistance and durability.

Capacitive touchscreen technology can be further divided into the surface and PCAP types, but the latter is most widely used these days. PCAP is further divided into self-capacitance and mutual-capacitance, or ITO and metal (depending on electrode materials).

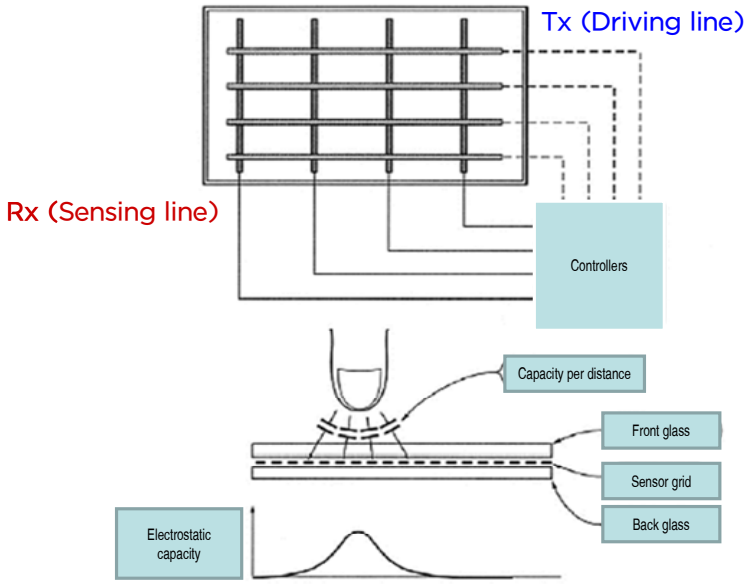
Surface capacitive touchscreens use a sheet of ITO with at least four electrodes around its periphery to calculate the x and y coordinates of a touch point. These electrodes sense the change in surface capacitance when a grounded object, such as a finger, approaches. This method, mostly used in casinos, is expensive and noisy, and does not support multi-touch features.

PCAP touchscreens feature a substrate on which each x-axis (Rx) electrode string is connected to a y-axis (Tx) driving line. The electrodes of the x- and y-axes can form patterns on one (horizontal) or more layers (vertical) through etching. The intersections need to isolated via insulators, and each intersection becomes an x, y coordinate.

PCAP touchscreens support multi-touch functions. Attempts had been made since the 1980s to develop multi-touch, but it was not until 2007, when the iPhone was released, that the technology became commercially available. Apple claims that it developed this technology, but Fingerworks produced the first multi-touch product at the end of the 1990s. (Apple acquired Fingerworks in 2005).

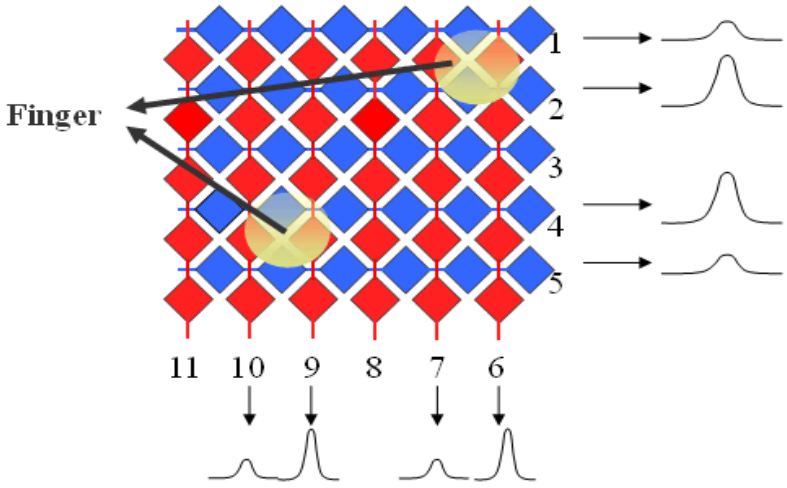
Most touchscreen panels are 10-point multi-touch screens. However, at the 2013 International Consumer Electronics Show, 3M demonstrated its 40-point multi-touch technology (metal mesh).

Figure 19. PCAP touchscreen (mutual-capacitive)



Source: Google

Figure 20. Multi-touch PCAP touchscreen (mutual-capacitive)



Source: Apex Material Technology (AMT)

Difference between self-capacitance and mutual-capacitance

Self-capacitive touchscreen technology measures changes in capacitance using one electrode for each pixel. As such, only one electrode layer is required. In Korea, CrucialTec has adopted this technology for its touchscreen panels.

As only one electrode layer is used, production costs related to self-capacitance are low, the signal-to-noise ratio (SNR) is high, and the side bezel is relatively thin. However, this method is rarely used due to its tendencies toward multi-touch ghosting and complicated electrode lines.

Mutual-capacitive sensors feature an x-y grid and can measure capacitance changes at every individual point on the grid to accurately determine touch points.

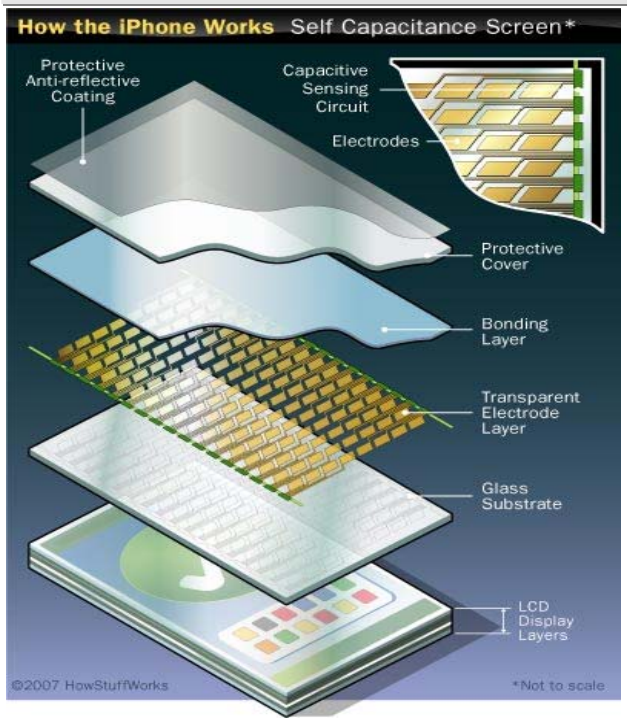
Many touchscreen panel makers use mutual-capacitive sensors because they do not have ghosting issues and their electrode lines are simple. Since the rollout of the Galaxy S4, which can be used while wearing gloves, interest in self–capacitance has increased, as some people believe that SEC switched to the technology to improve SNR. However, we believe that SEC improved the SNR of its flagship model by using a high voltage, rather than switching to self-capacitance from mutual-capacitance.

Table 9. Comparison of self-capacitance and mutual-capacitance

	Self-capacitance	Mutual-capacitance
Strengths	Thin side bezel, high sensitivity (SNR)	Easy to enable multi-touch; simple electrode structure
Weaknesses	Ghosting in multi-touch touchscreens, complicated electrode structure	Relatively low sensitivity (SNR)
Costs	Low	High
ITO	Single-layer	Multi-layer (two)
Makers	CrucialTec	Most touchscreen panel makers

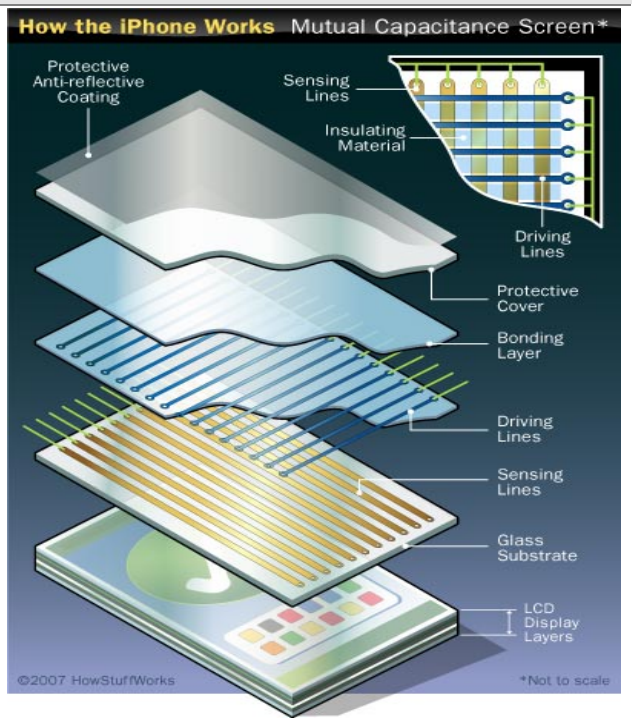
Source: KDB Daewoo Securities Research

Figure 21. Self-capacitance



Source: HowStuffWorks

Figure 22. Mutual-capacitance



Source: HowStuffWorks

PCAP stack-up structures

Currently, the most widely-used mobile-use touchscreens are PCAP panels. Under this technology, Tx and Rx electrodes are patterned in different layers. PCAP touchscreen can have a variety of stack-up structures depending on the: 1) location, 2) materials, and 3) production method of the layers on which patterns are formed.

Tx and Rx electrodes must be made out of conductive materials. However, metals cannot be used to produce electrodes, as electrodes are located in active display areas. Currently, ITO, a transparent conductive material, is the material of choice for most display panel electrodes. ITO is made by adding SnO_2 to In_2O_3 to improve conductivity. Meanwhile, the use of metal mesh and silver nanowire is also increasing. However, ITO is still favored, despite stronger resistance than metals, due to its transparency.

Layer stack-up structures ban be divided into three categories: 1) glass stack-up (electrodes on glass substrates), 2) film stack-up (electrodes on plastic substrates or films), and 3) electrode integration. The creation of glass and film layers is classified again into: 1) the add-on method, which requires a layer between a display panel and cover glass, and 2) OGS, which incorporates electrodes on cover glass. Currently, the add-on method is more widely used, but the OGS and electrode integration methods are expected to gain popularity going forward as they reduce costs and enable the production of thinner and lighter panels.

Stack-up structures vary depending on application and price. The glass stack-up method is divided into GG (SITO), GG (DITO), and G2 (OGS), the film stack-up method into GFF, G1F, and GF2 (DITO), and the integration method into in-cell and on-cell.

Although each method has some pros and cons, film stack-up is more favored than glass stack-up among add-on methods. With regard to glass stack-up methods, investments are tilting toward the G2 (OGS) method.

Figure 23. Comparison of touchscreen stack-up structures

	Key Process	Bezel	Slim	Light	Soft Touch	Price
GFF	Silk screen	△	○	○	○	◎
	Gravure offset	○	○	○	○	○
	DFR	○	○	○	○	△
GF2	DFR	○	○	○	○	△
G1F	PR Coating	◎	○	○	◎	△△
	Silk screen	△	○	○	◎	△
GG	PR Coating	◎	△	△	○	○
GG(multi layer)	PR multi coationg	◎	△	△	○	△
G2(DPW, TOC)	PR multi coationg	◎	◎	◎	◎	△△
G2(On-Cell)	PR multi coationg	◎	◎	◎	○	△

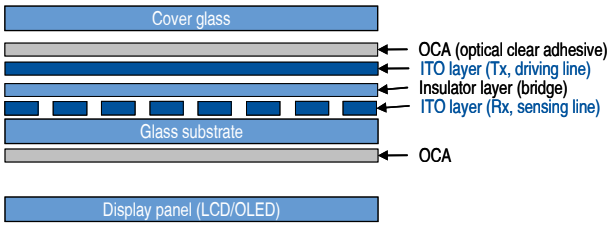
Source: DisplayBank

GG (glass-glass)

Glass-glass (GG) is an add-on stack-up method that inserts a glass sensor between cover glass and display panels (LCD and OLED). Glass substrates are steadily losing ground among add-on methods, despite boasting higher transmissivity than film substrates, due to their heavy and thick form factor and high costs. Glass substrates generally use soda-lime glass that is strengthened via chemical treatments.

There are two types of GG solutions: double-sided ITO (DITO) and single-sided ITO (SITO). While SITO features Tx and Rx electrodes on the same side, the Tx and RX electrodes of DITO are laid on opposing sides. We note that DITO does not require a bridge (passivation layer) and has better PCAP capabilities than SITO. However, the DITO type of touch solution is used only for Apple products as Apple holds the patent for the technology.

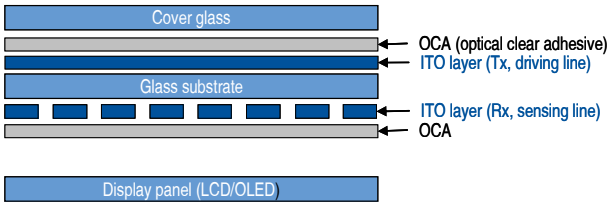
Figure 24. GG (glass-glass, SITO)



Strengths	1) Excellent optical quality 2) Excellent rigidity and durability (tempered glass) 3) Easily applicable to large-area displays (maintains characteristics as glass does not bend)
Weaknesses	1) Heavy and thick form factor 2) Relatively expensive cost structure vs. film-type 3) Additional process for insulator layer
Makers	- Wintek, TPK, Innolux, HannsTouch, Henghao, etc.
Products	- Nokia, HTC, Amazon Kindle, etc.

Source: KDB Daewoo Securities Research

Figure 25. GG (glass-glass, DITO)



Strengths	1) Excellent optical quality 2) Excellent rigidity and durability (tempered glass) 3) Easily applicable to large-area displays (maintains characteristics as glass does not bend)
Weakness	1) Heavy and thick form factor 2) Relatively expensive cost structure vs. film-type 3) Protection sheet required for double-sided process 4) Apple has patents for DITO
Makers	- Wintek, TPK, Innolux, etc.
Products	- Apple iPhone (up to 4S), iPad

Source: KDB Daewoo Securities Research

G2 (OGS)

The G2 method (OGS) does not require a separate layer for sensors, and, as such, electrodes are located on the cover glass. Thanks to the absence of a glass or film substrate, OGS panels boast superior optical properties, have lower materials costs, and are able to achieve thinner and lighter form factors. In addition, the method could minimize lamination defects, as G2 panels undergo the lamination process just once (no lamination process for the sensor layer).

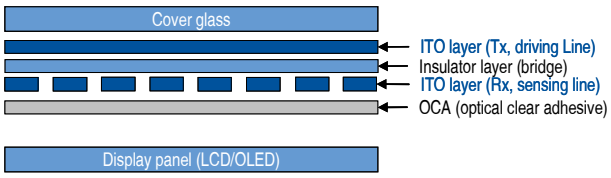
Due to such advantages, the G2 method is considered by many to be the most ideal stack-up structure. Although many touch panel producers are working on developing G2, only a handful of companies are mass-producing panels based on the technology; indeed, companies are having difficulties in improving price competitiveness due to low yields in mass production. The low yields are attributable to the close proximity of Tx and Rx electrodes to the cover glass and noise from the ITO electrodes of LCD color filters.

The G2 method is the only alternative to the in-cell and on-cell methods that have been widely adopted by display panel makers. As the in-cell and on-cell methods integrate capacitive touch sensors into display panels, they can only be utilized by large panel makers with display production facilities.

G2 is similar to in-cell and on-cell in that it does not have a separate sensor layer. However, the method is not easily customizable as it forms electrodes on the cover glass. In addition, the production of panels with white or light-colored bezels requires a thick black matrix (BM), which can be difficult to smoothly attach to sensor layers.

The G1M method is similar to the G2 method. The G2 method produces Tx and Rx electrodes on two ITO layers on the cover glass and prevents overlapping via the adoption of an insulation layer. Meanwhile, the G1M method creates Tx and Rx electrodes on one ITO layer and does not need an insulation layer. In addition, the 1M method enables the production of zero-bezel touchscreens. Still, it should be noted that, due to the high resistance of ITO electrodes, the G1M method can produce only two-point multi-touch screens smaller than five inches.

Figure 26. G2 (OGS)



Strengths	1) Excellent optical quality 2) Excellent rigidity and durability (tempered glass) 3) Thin and light form factor 4) Requires only one lamination process
Weaknesses	1) Limitations on heteromorphic design and bright bezels 2) Weak price competitiveness due to low yields 3) Requires additional process for insulator layer 4) Apple has patents for DITO
Makers	- Wintek, TPK, BOE, etc. - LG Innotek, ELK, Melfas, Dongwoo Fine-Chem, Hanhwa L&C, etc.
Products	- LGE Optimus G - Various Chinese smartphone makers (Huawei, ATE, Xiaomi Tech, etc.) - Various noteboook PC touchscreen solutions (Asus, Lenovo, etc.)

Source: KDB Daewoo Securities Research

G2: Differences between sheet and cell methods

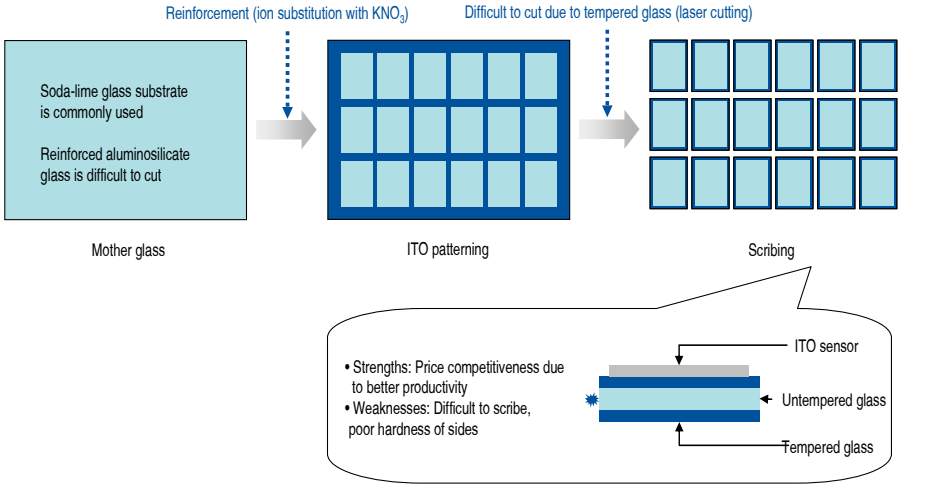
G2 production can be broken down into: 1) the sheet method and 2) the cell (or piece) method. While the GG method requires the use of glass sensors, the G2 method forms electrodes on cover glass. As cover glass requires high levels of tensile strength and durability, it must go through a chemical treatment process to improve its strength.

Soda-lime and aluminosilcate glass is used for glass substrates. While the tensile strength of general soda-lime glass ranges between 150 and 200MPa, soaking the glass in KNO_3 solution increases the strength to 400-500MPa. The strength of aluminosilcate glass improves to over 800MPa with chemical treatments. Thus, aluminosilcate glass is often used for premium mobile devices. Corning's Gorilla Glass and IOX-FS, and Asahi Glass' Dragontrail are types of aluminosilcate glass.

The sheet method creates BM, transparent electrodes, an insulation layer, and metal trace after strengthening the mother glass. After ITO patterning, producers scribe the glass to produce touchscreen modules. The sheet method greatly improves price competitiveness due to its strong productivity. However, it cannot be used for smartphones and tablet PCs that require high levels of tensile strength due to low rim strengths. Thus, touchscreens produced through the sheet method are used for notebook PCs or low-priced smartphones.

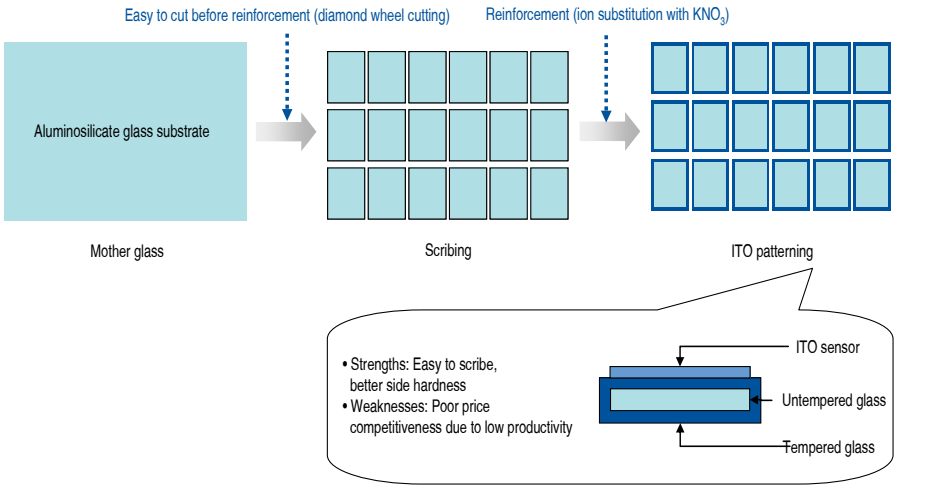
Unlike the sheet method, the cell method scribes the mother glass before the strengthening process. Accordingly, the method can produce touchscreens with superior strength. However, price competitiveness is weak due to low productivity.

Figure 27. Touchscreen panel manufacturing process (sheet-type)



Source: KDB Daewoo Securities Research

Figure 28. Touchscreen panel manufacturing process (cell-type)



Source: KDB Daewoo Securities Research

GFF (glass-film-film)

The glass-film-film (GFF) method places two film sensor layers between the cover glass and the display panel. Usually, the method forms ITO electrodes on the PET film. While film substrates are cheaper, thinner, and lighter than glass substrates, they have lower transmissivity and are more vulnerable to temperature and humidity changes. Low transmissivity leads to greater power consumption to secure a certain level of brightness.

The GFF method is simpler than many other processes, as it places Tx and Rx electrodes on separate films. However, it requires two film sensor layers, which boosts production costs and makes three lamination processes necessary. GFF is the most widely used method for touchscreens of smartphones and tablet PCs (non-Apple). Most of the touchscreen producers in Korea use the GFF method.

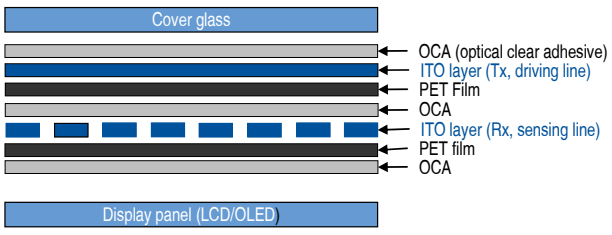
Most touchscreen producers are unable to carry out the ITO coating process in-house. Thus, they purchase ITO-coated films. Due to large initial investment costs and technological barriers, two Japanese companies (Nitto Denko, with a market share of 80%, and Oike, with a market share of 15%) dominate the global ITO-coated film market. Despite a protracted supply shortage since last year owing to a surge in tablet PC demand, producers are being very conservative about capacity expansion. Filmmakers are concerned that technological evolution toward the G2, G1F, and G2F methods might sharply depress ITO-coated film demand.

Table 10. Comparison of glass and film substrates

	Glass substrate	Film (PET) substrate
Heat resistance	125˚C -150˚C	80˚C
Aging effects	None	Yellowing, curling, surface strain
Transmissivity	≥ 90%	85%
Resolution	1um	50um
Thickness	Thick (0.3-1.0mm)	Thin (0.05-0.1mm)
Weight	Heavy	Light
Hardness	Require reinforcement	None
Lamination yield	High	Very hign
Cost efficiency	High	Low

Source: KDB Daewoo Securities Research

Figure 29. GFF (glass-film-film)



Strengths	1) Thin and light form factor 2) No limits on heteromorphic design and bright bezels 3) High investment efficiency
Weaknesses	1) Poor transmissivity 2) Relatively high power consumption 3) Relatively high costs due to use of two ITO films 4) Substrate distortion due to temperature and humidity
Makers	- Young Fast, J-Touch, Nissha Printing, O-Film, etc. - Iljin Display, S-MAC, ELK, etc.
Products	- SEC Galaxy Tab, Note 10.1 - Applied to a few notebook PC models (Lenovo, etc.)

Source: KDB Daewoo Securities Research

Glass-based G1F and GF2

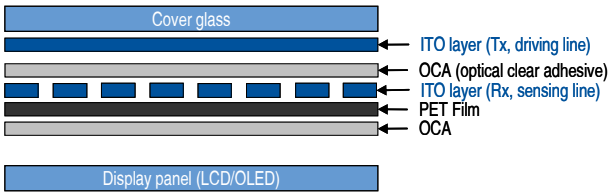
The G1F and GF2 methods insert a single film sensor between a cover glass unit and a display panel. They are designed to resolve the weaknesses of the most-widely used film-based GFF technology, including optical weakness, large power consumption, and heavy costs.

G1F forms one ITO electrode on the cover glass and puts the other electrode on the film. Initial investments in the technology could be heavy, as it requires glass and film sensor equipment. Since electrodes are attached directly to cover glass in G1F, accommodating various designs and bright bezels is difficult with the technology.

GF2 forms ITO electrodes on both sides of a film. Unlike G1F, this method is compatible with bright bezels and various designs, as it does not attach electrodes on the cover glass. In addition, as the technology does not require glass sensor equipment, initial investments are relatively low. However, cost burden is heavy due to the complicated electrode formation process and still-low production yields.

Currently, only the iPad mini is based on GF2 technology (Apple holds the patent for the technology). Although G1F and GF2 have edges over GFF technology in terms of optical features and power consumption, it should be noted that they can require heavy investments and generate low yields. From a medium- to long-term perspective, we do not believe that G1F and GF2 technologies will prosper, as they do not have competitive edges over integrated cover glass and in-cell/on-cell touch solutions.

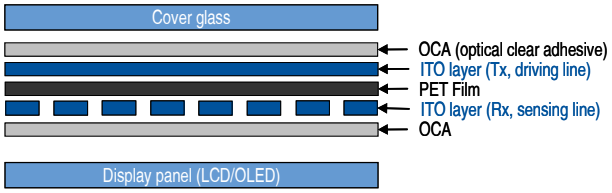
Figure 30. G1F (glass-film)



Strengths	1) Thin and light form factor 2) Relatively low costs due to one ITO film 3) Better optical characteristics and power consumption vs. GFF
Weaknesses	1) High capex, as it requires both glass and film sensor lines 2) Substrate distortion due to temperature and humidity 3) Difficult to make heteromorphic designs and bright bezels
Makers	- Young Fast, J-Touch, O-Film, etc. - Melfas, Nepes Display
Products	- SEC Galaxy S Duos - Microsoft Surface, Galaxy Note 8.0, etc.

Source: KDB Daewoo Securities Research

Figure 31. GF2 (glass-film, DITO)



Strengths	1) Thin and light form factor 2) Relatively low costs due to one ITO film 3) Better optical characteristics and power consumption vs. GFF type 4) No limits on heteromorphic designs and bezels
Weaknesses	1) Protective film is required for double-sided process 2) Substrate distortion due to temperature and humidity 3) Apple holds patent for DITO
Makers	-Nissha Printing
Products	- Apple iPad mini

Source: KDB Daewoo Securities Research

On-cell and in-cell technologies

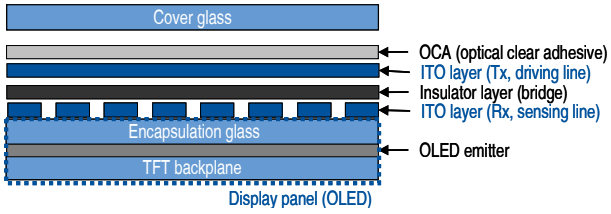
On-cell/in-cell technologies embed Tx and Rx electrodes inside display panels. As these technologies are mainly relevant to LCD and OLED panel production, only large panel makers are capable of using them. Due to the fact that on-cell/in-cell does not require the use of glass sensors and film sensors, these technologies enable the production of thin and light panels These panels boast low power consumption thanks to superior optical features. Due to the fact that these technologies do not require any cover glass-related processes, they have no limitations regarding design and bezels.

On-cell technology forms an ITO electrode on the upper side of the panel. Samsung Display has adopted this technology to produce OLED panels. And SEC's Galaxy S4 and Galaxy Note 2 have both adopted these panels. This technology should be more widely applicable once production lines become capable of attaching sensors on the encapsulation glass (this process is currently quite difficult). Due to high defect rates, mass production at LCD lines is also difficult to achieve.

In-cell technology forms an ITO electrode inside the panel. Although it can make use of the electrodes used in existing TFT technology, the availability of in-cell for large-sized panels is low. LGD, Japan Display, and Sharp have employed this technology, and the iPhone 5 and Vega Iron are based on this technology.

Currently, both on-cell and in-cell panels are mostly based on projected capacitive touch panel (PCTP) technology. Although some companies have developed voltage and light sensing technologies, their positions in the marketplace are negligible.

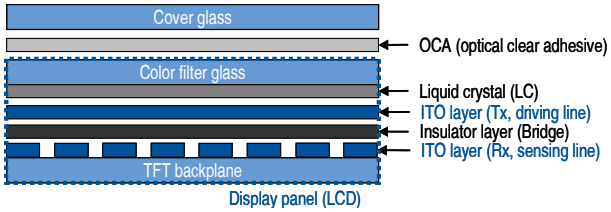
Figure 32. On-cell (OCTA, on-cell touch AMOLED)



Strengths	1) Thin and light form factor 2) Excellent optical characteristics, power efficiency, and durability 3) No limits on heteromorphic designs and bezesl
Weaknesses	1) Only display panel makers can manufacture on-cell 2) Difficult to apply to film encapsulation 3) Difficult to apply to LCD panels due to poor C/F yield
Makers	- Samsung Display
Products	- Galaxy S4, Galaxy Note 2, etc.

Source: KDB Daewoo Securities Research

Figure 33. In-cell (LCD)



Strengths	1) Thin and light form factor 2) Excellent optical characteristics, power efficiency, and durability 3) No limits on heteromorphic designs and bezels 4) Shares metal electrodes on TFT
Weaknesses	1) Only display panel makers can manufacture in-cell 2) Difficult to enlarge due to TFT signal noise 3) Efficient only in mass production as production line adjustments are required
Makers	- Japan Display, Sharp - LG Display
Products	- Apple iPhone 5, Pantech, Vega Iron

Source: KDB Daewoo Securities Research

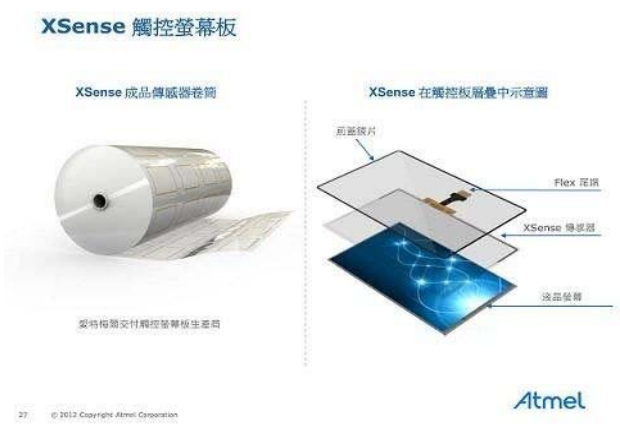
Metal mesh and silver nanowire technologies

Despite their high resistance levels, transparent ITO electrodes are widely used in touchscreens. However, some firms are working to develop alternative electrodes due to: 1) the heavy costs of applying transparent ITO electrodes to large-sized screens, 2) concerns over a supply shortage of indium, and 3) issues related to the production of flexible displays. Currently, the most likely alternatives are metal mesh- and silver nanowire-based electrodes.

Metal mesh technology creates a touch panel electrode using 2-6μm -thick nontransparent metal (e.g., copper and silver). As panels produced under this process are highly conductive, their resistance is low. However, permeability is very poor. In addition, when applied to high-resolution displays (more than 200ppi), the moiré phenomenon can occur. Currently, 5-6μm-thick metal panels are used to produce 20-inch-or-larger monitors. And applying this technology to notebook and tablet PCs requires 3-4μm-thick metal panels. Atmel, UniPixel, 3M, Fujifilm, MasTouch, and Young Fast produce metal mesh panels. On the domestic front, MNtech, LG Chem, ELK, and InkTec are working to mass produce these panels. MNtech began to supply metal mesh panels to SEC (for use in all-in-one PCs) in 2H12, and possesses 1,400mm-wide roll-to-roll equipment.

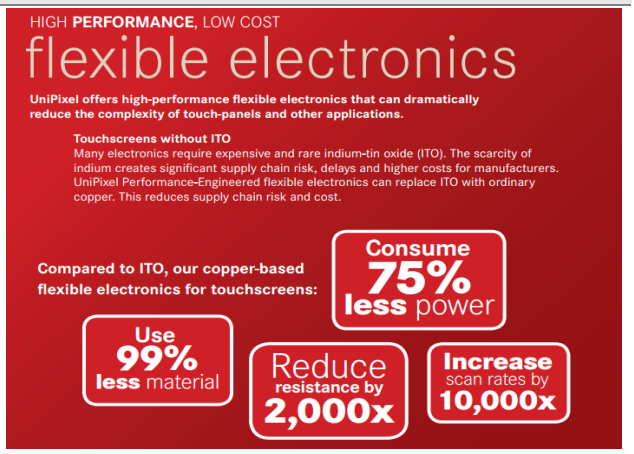
Silver nanowire technology coats panels with tiny silver wires. This technology, held by Cambrios, was adopted by LGE in its all-in-one PCs. In addition, Samsung Venture Investment invested US$5mn in Cambrios in January 2012.

Figure 34. Atmel XSense (Metal mesh touch solution)



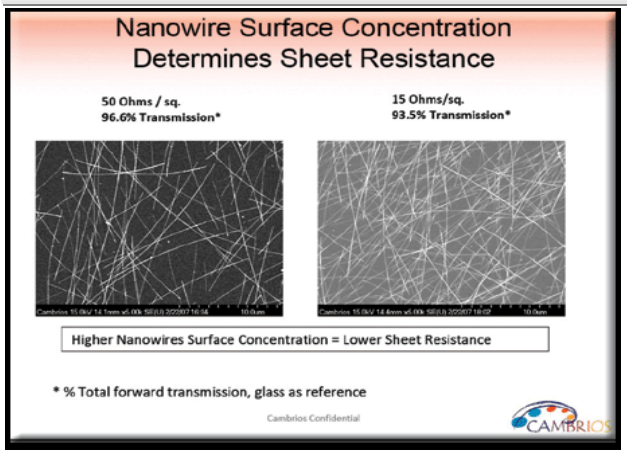
Source: Atmel

Figure 35. UniPixel UniBoss (metal mesh)



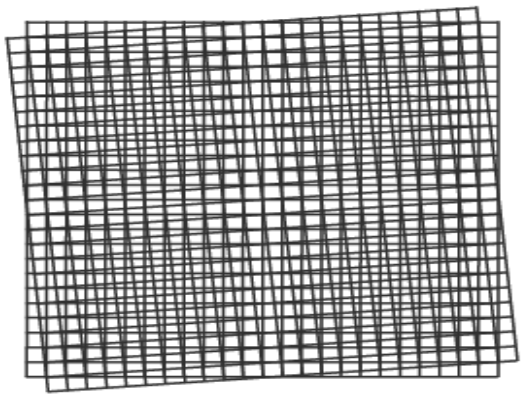
Source: UniPixel

Figure 36. Cambrios ClearOhm (silver nanowire touch solution)



Source: Cambrios

Figure 37. Moiré effect



Source: Wikipedia

CNT and graphene

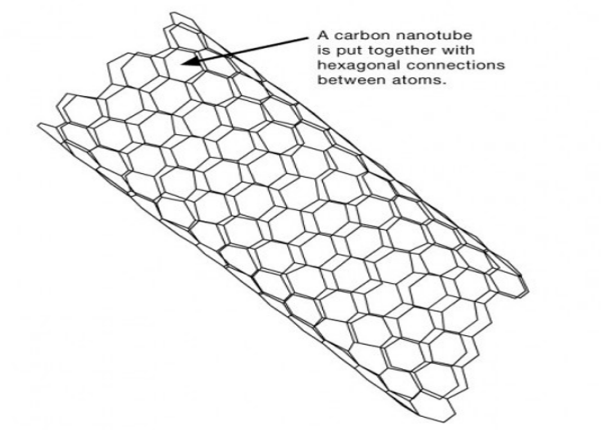
Carbon nanotubes (CNT) are 1nm in diameter, 100 times stronger than steel, and 1,000 times more conductive than copper. While thin copper emits strong heat, CNT enables stable current circulation.

US-based Eikos developed a transparent and conductive film using single-walled CNT, applied for a related patent, and rolled out a product named Invisicon. US-based Unidym acquired CNI, a CNT specialist, in 2007 and released the world's first CNT-based electronic paper display (developed in partnership with SEC) in 2008. Korea-based Wisepower acquired Unidym in 2011, but the company is about to be delisted due to failing financials.

Japan-based Mitsubishi Rayon announced the development of a single-walled transparent conductive film, but the properties of the film are not sufficient for commercialization. Within Korea, Sangbo is about to commercialize hybrid touch sensors (developed using CNT and ITO electrodes). The company invested W10bn to mass produce the product (scheduled for 2H).

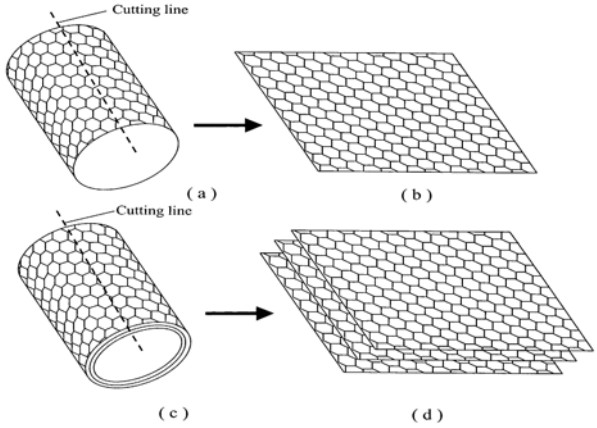
Graphene—a combination of graphite and the suffix "-ene"—shares the same shape as carbon-bonded composites, while CNT is cylindrical. Graphene is harder than steel but also flexible. As existing ITO electrodes are not simultaneously conductive and flexible, CNT and graphene are drawing attention as alternative electrode materials for flexible displays.

Figure 38. Structure of CNT



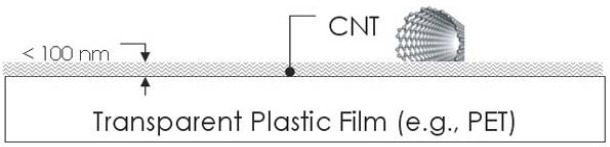
Source: Wikipedia

Figure 39. Structure of graphene



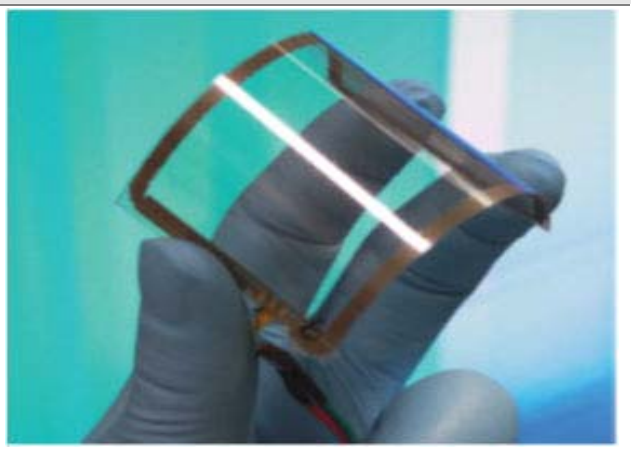
Source: Wikipedia

Figure 40. Eikos' CNT transparent electrode - Invisicon



Source: Eikos

Figure 41. Flexible touch sensor with graphene



Source: DisplayBank

Other players: IR, SAW, optical technologies

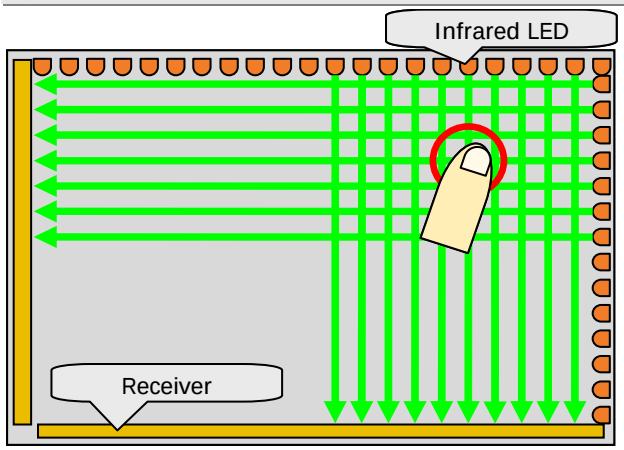
Minor touchscreen technologies include infrared (IR), surface acoustic wave (SAW), and optical. The existing PCAP technology has become a major technology for small- and medium-sized touchscreens, but it has limitations in producing economically feasible large-sized panels. As such, non-PCAP technologies focus on large-sized screens.

IR technology is applicable to a broad range of panels—from small-sized to 150-inch panels. It enables multi-touch solutions, but only with thick bezels and low resolutions. IR is usually used in e-book readers such as the Kindle (Amazon) and the Nook (Barnes & Noble). A major IR company is Sweden-based Neonode. But it should be noted that Neonode does not produce hardware.

SAW technology, which is based on waves, can be applied to wireless communications, touch solutions, and zero-bezel displays. Currently, US-based Elo Touch Solutions and China-based General Touch are dominating this area.

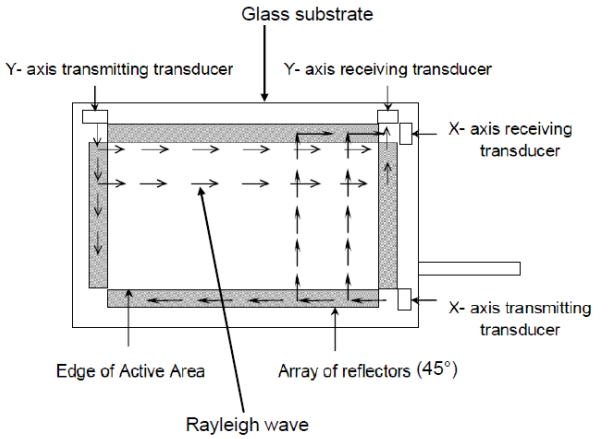
Optical technology facilitates touch solutions via the use an actual camera. This technology is not suitable for mobile devices, but is applicable to DID and table displays. SEC's table display SUR40 is based on this optical technology. Currently, New Zealand-based NextWindow and US-based Perceptive Pixel are major players in this business area. Perceptive Pixel was established by Jeff Han in 2006 and acquired by Microsoft in June 2012.

Figure 42. IR touch solution



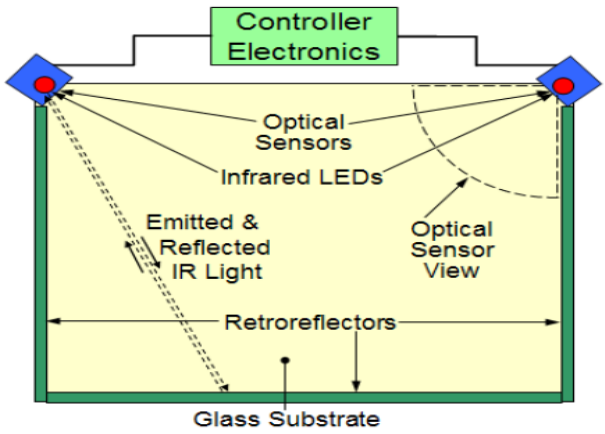
Source: DisplaySearch

Figure 43. SAW touch solution



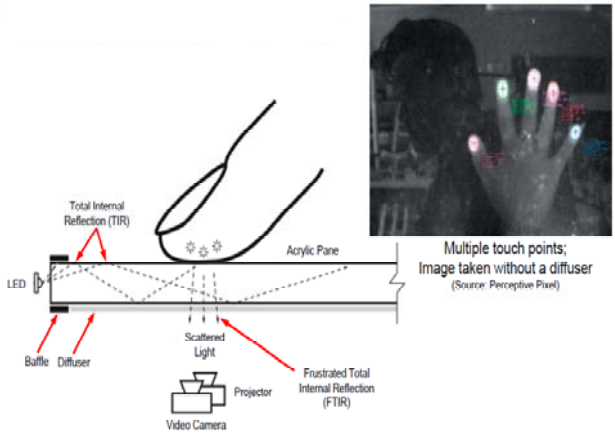
Source: OneTouch

Figure 44. Optical touch solution



Source: NextWindow

Figure 45. Perceptive Pixel's (Microsoft) touch solution



Source: Microsoft

Stylus technology

Styluses such as SEC's S-Pen (for the Galaxy Note series) are adding new facets to the touchscreen experience. Stylus touchscreen technologies are divided into: 1) passive, 2) active, and 3) electromagnetic resonance (EMR) types. We note that, unlike passive and active technologies, EMR requires the use of a separate digitizer.

In passive and active technologies, a stylus simply replaces fingers as the means of input, and, as such, these technologies cannot accommodate proximity sensing and palm rejection function. A passive stylus is battery/coil-free, and thus needs a thick tip (at least 5mm) to mimic human body capacitance. A battery-powered active stylus can use a smaller tip (2mm). Currently, Adonit and N-trig produce active styluses.

The digitizer layer of an EMR-based stylus system allows touchscreens to differentiate between fingers and a stylus (proximity sensing and palm rejection are available). The biggest advantage of this technology is its ability to accommodate small styluses that can still sense different touch pressures. Core technologies are held by Wacom and Waltop. SEC's S-Pen is based on Wacom's solutions. Related Korean companies include: Partron (EMR stylus under development), digitizer producers including Interflex and Flexcom, and materials suppliers such as Changsung, Innox and InkTec.

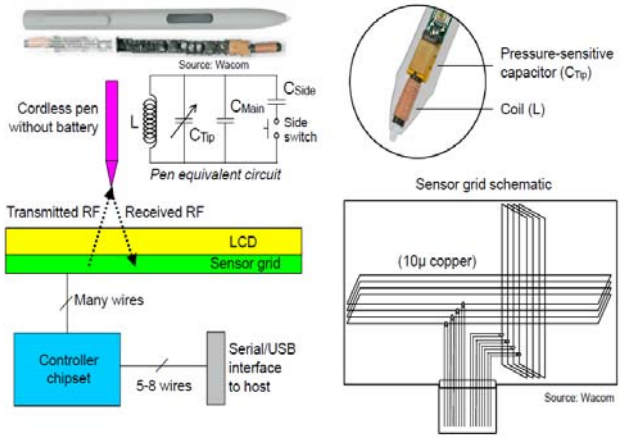
Figure 46. LGE's Vu II (passive-type stylus)

Source: LG Electronics

Figure 47. Adonit Jot Touch (active-type stylus)

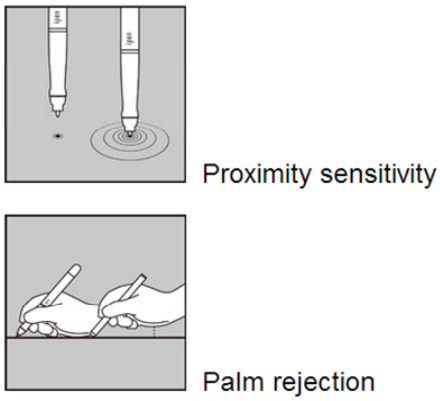
Source: Adonit

Figure 48. Wacom (EMR-type stylus/digitizer)



Source: Wacom

Figure 49. Key advantages of EMR-type stylus



Source: Cregle

Standardization vs. variety

As we outlined earlier, different business models are required for touchscreens used in smartphones/tablet PCs and those for notebooks/monitors. While smartphones and tablet PCs demand customized touch panels to fit the specific needs of each model, notebooks and monitors are increasingly adopting standardized touch panel technologies to cut costs through mass production.

For large-area touchscreens (notebooks and monitors), OGS technology is expected to become mainstream. Other technologies, such as the add-on type and the in-cell/on-cell types, present various challenges. As for the add-on type, the high resistance of ITO films makes applying the technology to large-area screens difficult, and the use of ITO glass results in a heavier and thicker form factor. The in-cell/on-cell types are not yet sound enough to be used in large-area screens. Of the two different types of OGS technology (sheet-based and cell-based), the sheet type seems better positioned to become the core technology of large-area touchscreens given its cost competitiveness.

Last year, 62% of smartphones adopted add-on touchscreens (vs. 13% for on-cell, 8% for in-cell, and 3% for OGS). The on-cell type was mostly used in SEC's OLED smartphones, while the in-cell type was first used in Apple's iPhone 5. Going forward, the use of add-on technology is likely to decrease steadily, while demand for on-cell and OGS is projected to grow steadily.

Table 11. Smartphone touchscreen market breakdown (by technology)

Technology	11	12	13F	14F	15F	16F
Add-on type (GG, G1F, GFF)	70%	62%	49%	39%	32%	27%
In-cell	0%	8%	15%	16%	16%	16%
On-cell	9%	13%	16%	18%	20%	22%
OGS	2%	3%	9%	20%	25%	29%
Other	20%	14%	10%	8%	7%	6%

Source: DisplaySearch, KDB Daewoo Securities Research

The add-on type prevailed in the tablet PC market until last year (application of on-cell/in-cell and OGS technologies to large-area screens is difficult due to low production yields). However, the adoption of on-cell/in-cell and OGS types is forecast to increase steadily. As <Table 12> shows, various touchscreen technologies will likely coexist in the market for the foreseeable future.

Table 12. Tablet PC touchscreen market breakdown (by technology)

Technology	11	12	13F	14F	15F	16F
Add-on type (GG, G1F, GFF)	95%	84%	71%	62%	45%	23%
In-cell	0%	0%	0%	0%	1%	11%
On-cell	0%	5%	12%	16%	22%	30%
OGS	2%	8%	14%	18%	28%	33%
Other	3%	4%	4%	4%	4%	3%

Source: DisplaySearch, KDB Daewoo Securities Research

As of last year, 52% of notebooks adopted add-on touchscreens, while 12% used the OGS type, and 36% relied on other technologies, including metal mesh. OGS demand from notebooks is likely to pick up full swing beginning this year, and, by 2016, 83% of notebook touchscreens should be based on this technology. While OGS technology is likely to become mainstream for large-area screens, demand for the metal mesh type will surely exist due to its low resistance.

Table 13. Laptop touchscreen market breakdown (by technology)

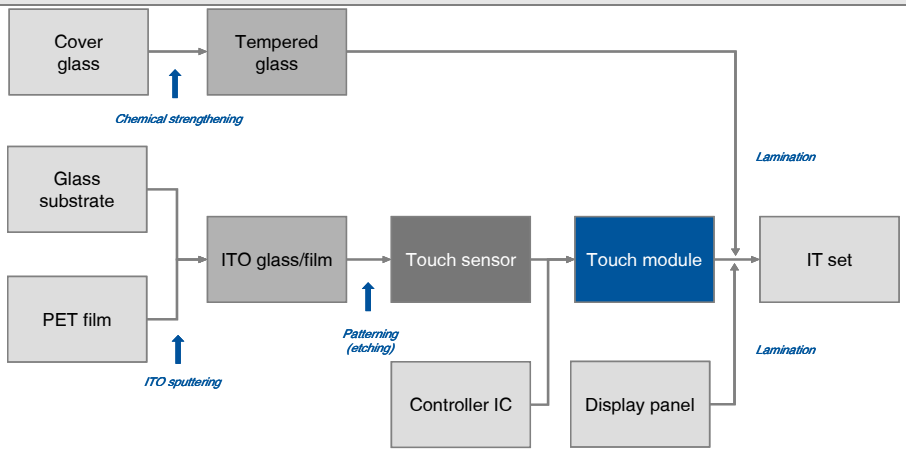
Technology	11	12	13F	14F	15F	16F
Add-on type (GG, G1F, GFF)	54%	52%	11%	4%	2%	2%
In-cell	0%	0%	0%	0%	0%	0%
On-cell	0%	0%	0%	0%	0%	0%
OGS	13%	12%	65%	78%	82%	83%
Other	34%	36%	24%	18%	16%	16%

Source: DisplaySearch, KDB Daewoo Securities Research

2. Production process

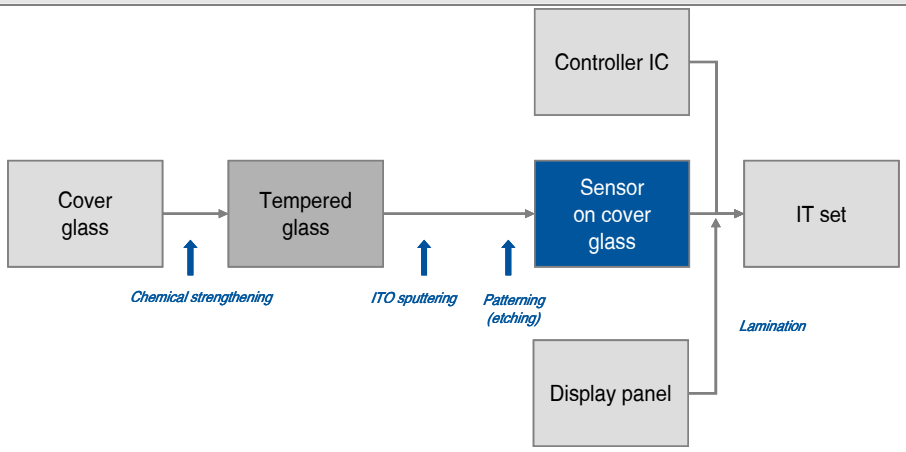
Broadly speaking, the production process for touch panels can be broken down as follows: cover glass finishing → sensor patterning → lamination. However, the process may differ on a case-by-case basis, depending on which type of touchscreen (add-on, in-cell/on-cell or integrated) is being manufactured.

Figure 50. Manufacturing process for add-on touchscreens



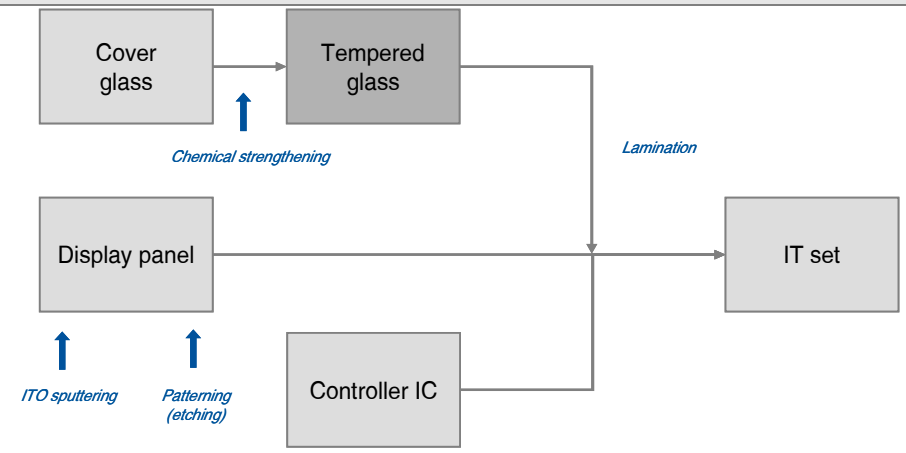
Source: KDB Daewoo Securities Research

Figure 51. Manufacturing process for OGS touchscreens



Source: KDB Daewoo Securities Research

Figure 52. Manufacturing process for embedded (on-cell/in-cell) touchscreens



Source: KDB Daewoo Securities Research

Cover glass production

Cover glass production involves four steps: scribing (grinding, hole drilling, etc.), chemical strengthening, screen printing, and surface coating.

The sheet-based process (chemical strengthening → sensor patterning → screen printing → scribing) is becoming increasingly popular for the production of G2-type (cover glass + sensors) touchscreens. This method is technically challenging, because scribing chemically strengthened glass is difficult, and additional chemical processes may be required to strengthen sections.

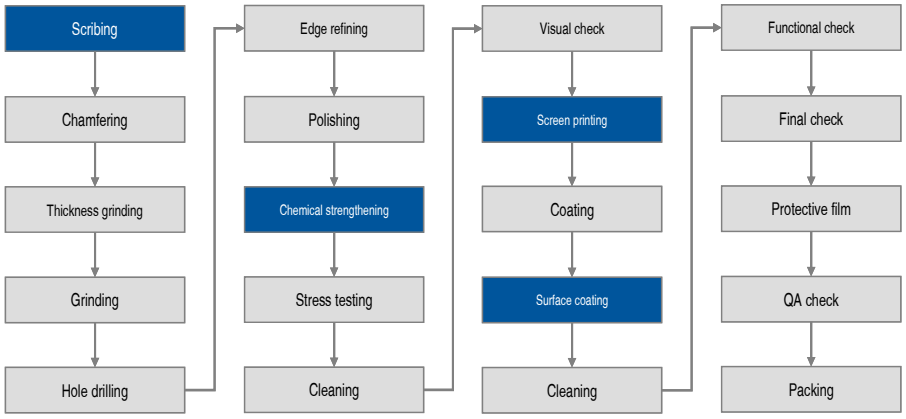
There are two types of glass substrates: soda-lime and aluminosilcate. Chemical strengthening can improve glass hardness, from 150-200MPa to 400-500MPa for soda-lime glass, and up to 800MPa for aluminosilcate glass. Aluminosilcate glass is mainly used in premium mobile devices. Aluminosilcate glass brands include Corning's Gorilla Glass and IOX-FS, and Asahi Glass' Dragontrail.

Chemical strengthening is the most difficult and time-consuming process in cover glass production. The process accounts for 30-40% of total production costs and directly affects production yields. Once glass is put in a KNO_3 bath for 5-6 hours (500°C), Na+ ions from the surface layer are exchanged for larger ions (K+), which increases the hardness of the glass. The higher the depth of layer (thickness of glass after ion exchange), the harder the glass is. Gorilla Glass' depth of layer is 40μm (IOX-FS: 20μm; soda-lime: 10μm).

Compared to the production processes for touchscreens and other panels, cover glass production is labor-intensive (low automation rates), and production yields and quality are heavily influenced by the skills and know-how of workers. Due to poor working conditions (heat, chemicals, noise from computerized numerical control scribing/grinding equipment, etc.), most production facilities are located in China.

Major cover glass makers include Biel Crystal, Lens Technology, and G-Tech Optoelectronics. In Korea, Taeyang Electronics and Avatec produce a small quantity.

Figure 53. Manufacturing process for cover glass



Source: DisplayBank, KDB Daewoo Securities Research

Sensor patterning - printing method

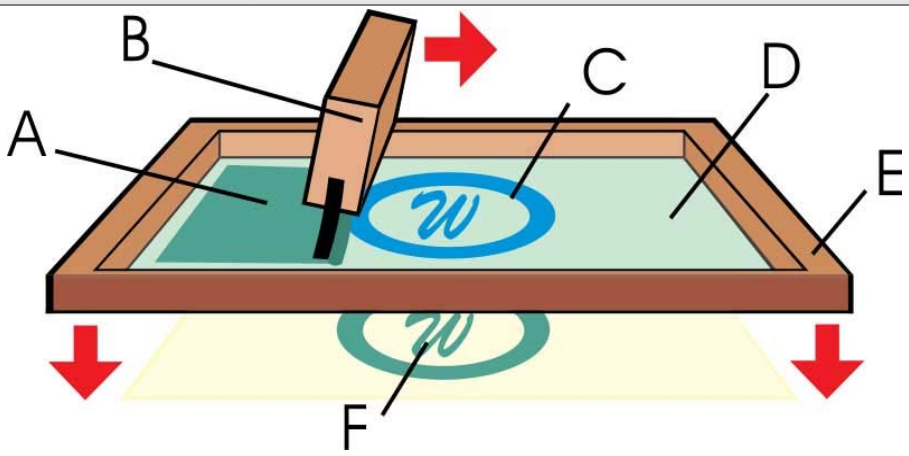
Touchscreen panel makers choose a sensor patterning process depending on which electrode materials they are using. For ITO sensor and silver (Ag) electrode patterning, printing or photolithography is used. In sensor patterning, costs (investment cost and yields) and electrode finger width are the most important variables. While printing is more cost competitive than photolithography, the process results in wider electrode finger spacing. Demand for finer patterns is rising, as thin bezels are being increasingly used in smartphones and tablet PCs.

The printing method is further divided into silk-screen printing and the gravure offset method. Roll-to-roll printing is more productive than sheet printing.

Silk-screen printing uses screen masks to form a pattern. This process is relatively simple, and the printing equipment is cheap, but it cannot make fine patterns. Thus, this process is mainly used to form 100μm-wide patterns. Furthermore, screen masks need to be replaced regularly as they tend to stretch. Most film-based sensors adopt this technology.

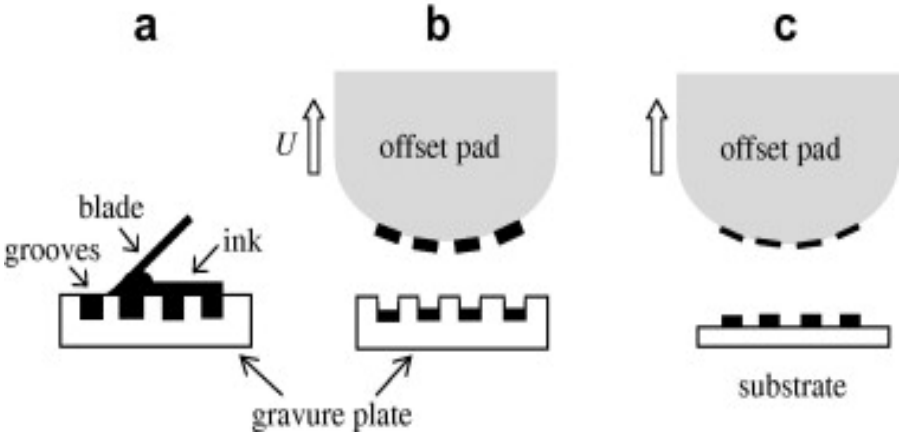
In gravure offset printing, ink is transferred with the help of an offset material from a patterned gravure plate to a substrate. As the gravure offset method can make use of roll-to-roll printing, it is more productive than screen printing. The electrode finger width can be reduced to up to 30μm.

Figure 54. Silk-screen printing process



Source: Wikipedia

Figure 55. Gravure offset process



Source: Wikipedia

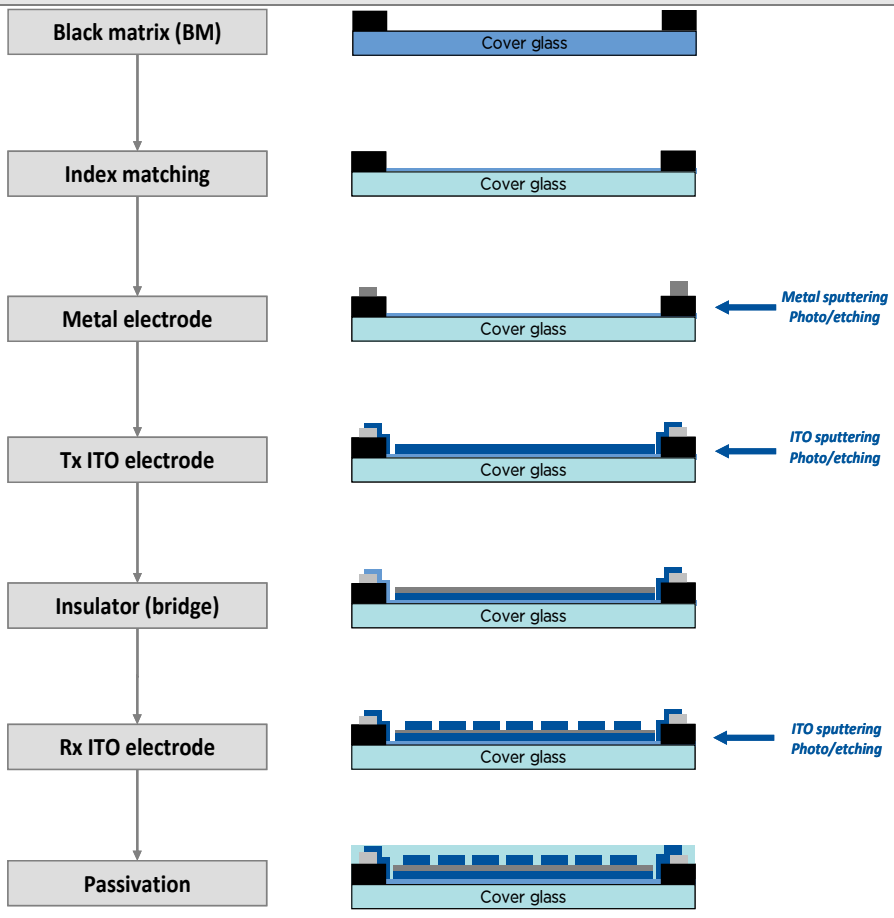
Sensor patterning – photolithography

Photolithography printing is similar to the patterning processes of semiconductors and LCDs. The process involves six masks (BM, metal, Tx ITO, insulator, Rx ITO, passivation) and seven layers (index matching is added). Index matching is intended to hide ITO patterns (through the oxide coating of substrates and refraction adjustments), because light penetration and reflectivity are affected by ITO transparency.

Photolithography printing can be costly early on, but the technology can form fine patterns (less than 30μm), which allow for thinner bezels. As such, demand for photolithography printing is rising.

Photolithography printing is further divided into the photosensitive paste (Ag) and metal-on-ITO methods. Photosensitive paste is a silver paste combined with photosensitive materials. In metal-on-ITO patterning, metal (Cu or Ag alloy) is deposited on the electrode surface, on which photoresist is sprayed to form patterns (via light exposure and etching). The photosensitive paste method is simpler, but the metal-on-ITO method can produce finer patterns.

Figure 56. Manufacturing process for OGS touchscreen panels with photo equipment



Source: KDB Daewoo Securities Research

Comparison of electrode pattering processes

Consumers are increasingly seeking smartphones and tablet PCs that boast both large screens and high mobility levels. As such, mobile device makers cannot focus solely on making screens larger. Thus, in order to maximize screen sizes without sacrificing mobility, device makers are finding it necessary to minimize bezel widths. Since electrical wires are installed in bezels, the key technology involves minimizing the line width of the wires. In particular, as the number of electrical wires increases in line with screen size, the electrode patterning process holds the key to reducing bezel thickness.

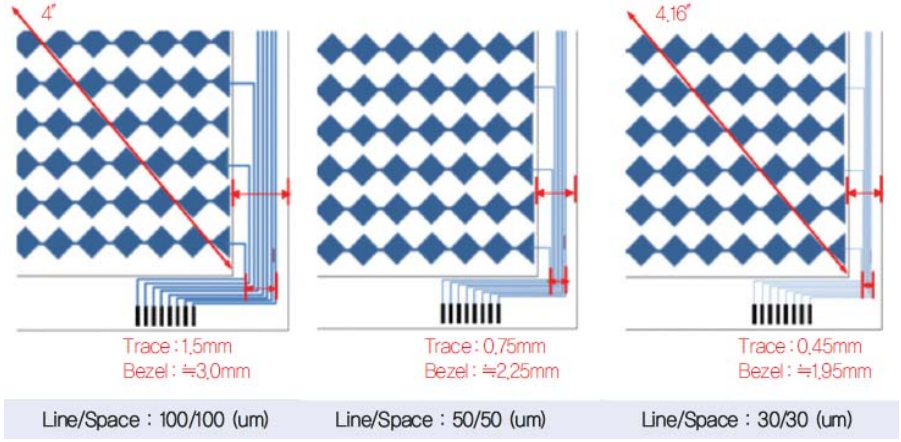
There are four electrode patterning options available: 1) screen printing, 2) metal-on-ITO, 3) photosensitive paste, and 4) the gravure offset process. Screen printing has the advantages of low investments/materials costs, simplicity, and high reliability, but it is difficult to pattern a fine line width of less than 100μm using this process. Metal-on-ITO has the disadvantages of high investments/materials costs and complexity, but it is the only electrode patterning process that can make a line width of less than 30μm. The photosensitive paste process, which has been adopted by only a handful of makers, has not been tested in mass production yet. Lastly, the gravure offset process, which has a high entry barrier due to its technological requirements, appears to be a competitive process.

Table 14. Comparison of electrode patterning processes

	Screen printing	Gravure offset	Photosensitive paste (Ag)	Metal on ITO
Min. line width (line/space, um)	100/100	30/30	30/30	≥ 30/30 (currently 15/15)
Resolution	Low	High	High	Very high
Capex	Low	Normal	Normal	High
Material costs	Low	Low	Normal	High
Number of processes	Small	Normal	Normal	Many
Technical level	Low	Very high	Normal	High

Source: DisplayBank

Figure 57. Comparison of bezel widths by line width



Source: DisplayBank

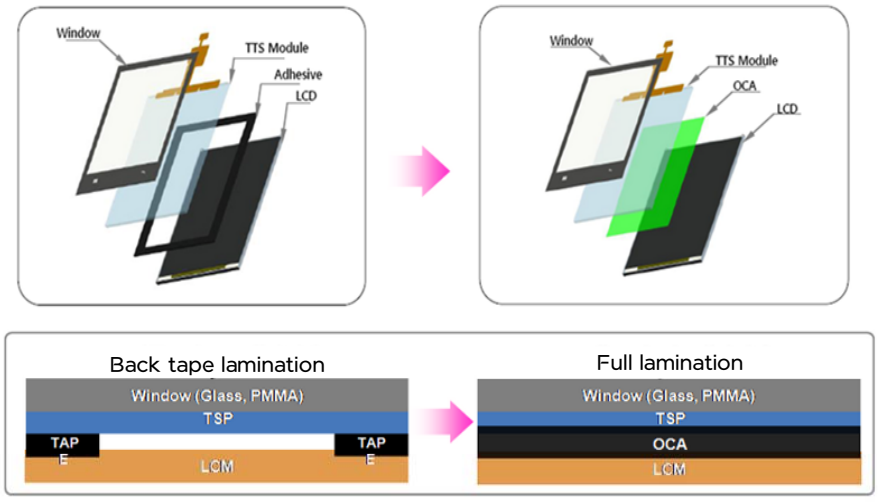
Lamination process

Lamination is the process that bonds a display panel, touchscreen, and cover glass in a stack. It is a simple but important process that determines the competitiveness of touchscreen makers, as securing high lamination yields is difficult. Touchscreen makers currently display an average lamination yield of 80-95%. The in-cell and on-cell types require only one lamination, while the add-on type needs two to three laminations. As the number of laminations increase, yields fall. For three laminations, yields drop to 51-86%.

There are two lamination methods: 1) air gap bonding and 2) direct bonding (or full lamination) The air gap bonding method attaches two pieces together via the application of adhesive only to the edges of the pieces. Meanwhile, direct bonding applies optically clear adhesive (OCA) all over the faces of the pieces to be bonded.

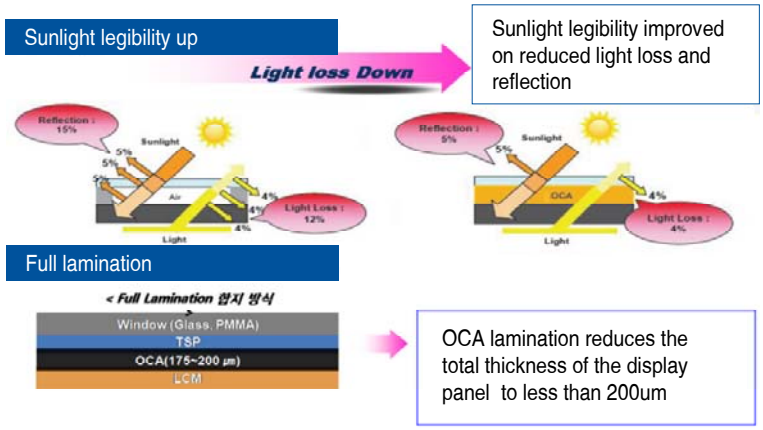
Air gap bonding displays relatively high yields but has inferior optical properties, while direct bonding exhibits relatively low yields but superior optical properties (including high sunlight legibility) and lower power consumption. Air gap bonding yields a high reflection coefficient (15%) and significant loss of light (12%) due to an air gap between bonded layers. Direct bonding results in a lower reflection coefficient (5%) and less loss of light (4%), improving sunlight legibility by 60%. As such, direct bonding is currently applied to most high-end smartphones.

Figure 58. Comparison of air gap bonding and direct bonding (full lamination)



Source: Pantech

Figure 59. Advantages of direct bonding (full lamination)



Source: Pantech

3. Touchscreen controller IC

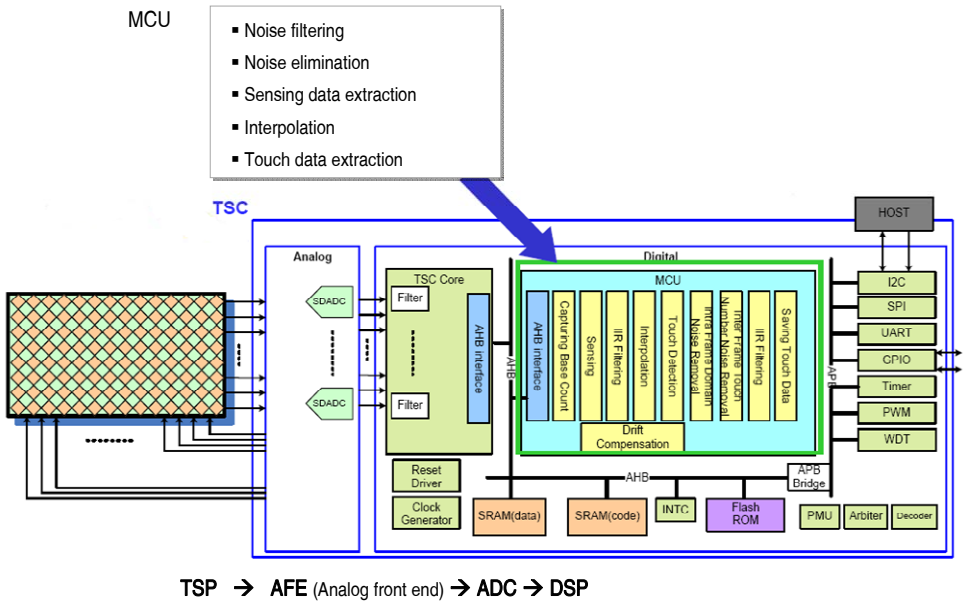
The touchscreen controller IC is a system semiconductor that operates a touchscreen. The key properties of a touchscreen controller IC are: 1) its channel number and 2) SNR.

Channel number refers to the number of Tx and Rx electrodes in a touchscreen panel. A higher number indicates a high number of electrodes, allowing for the production of large-sized touchscreen panels and fine-touch control. If a large-sized touchscreen panel does not have enough channels, multiple chips should be used.

As for SNR, the higher the ratio is, the more precisely the controller IC can interpret touch signals (leading to higher touch sensitivity). The Galaxy S4's hovering touch function and glove-friendly touchscreen were made possible by a chip with high SNR.

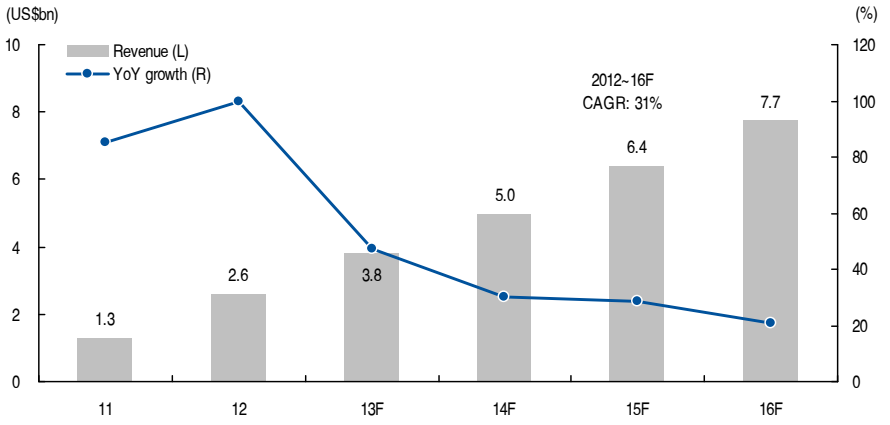
We expect the touchscreen controller IC market to reach US$3.8bn (+47% YoY) this year. Major touchscreen controller IC suppliers include Atmel, Synaptics, Cypress, Elan, and Ilitek. Korean suppliers include Melfas and Zinitix.

Figure 60. Structure of touchscreen controller IC



Source: Postech

Figure 61. Touchscreen controller IC market



Source: DisplaySearch

IV. Analysis of touchscreen supply chain

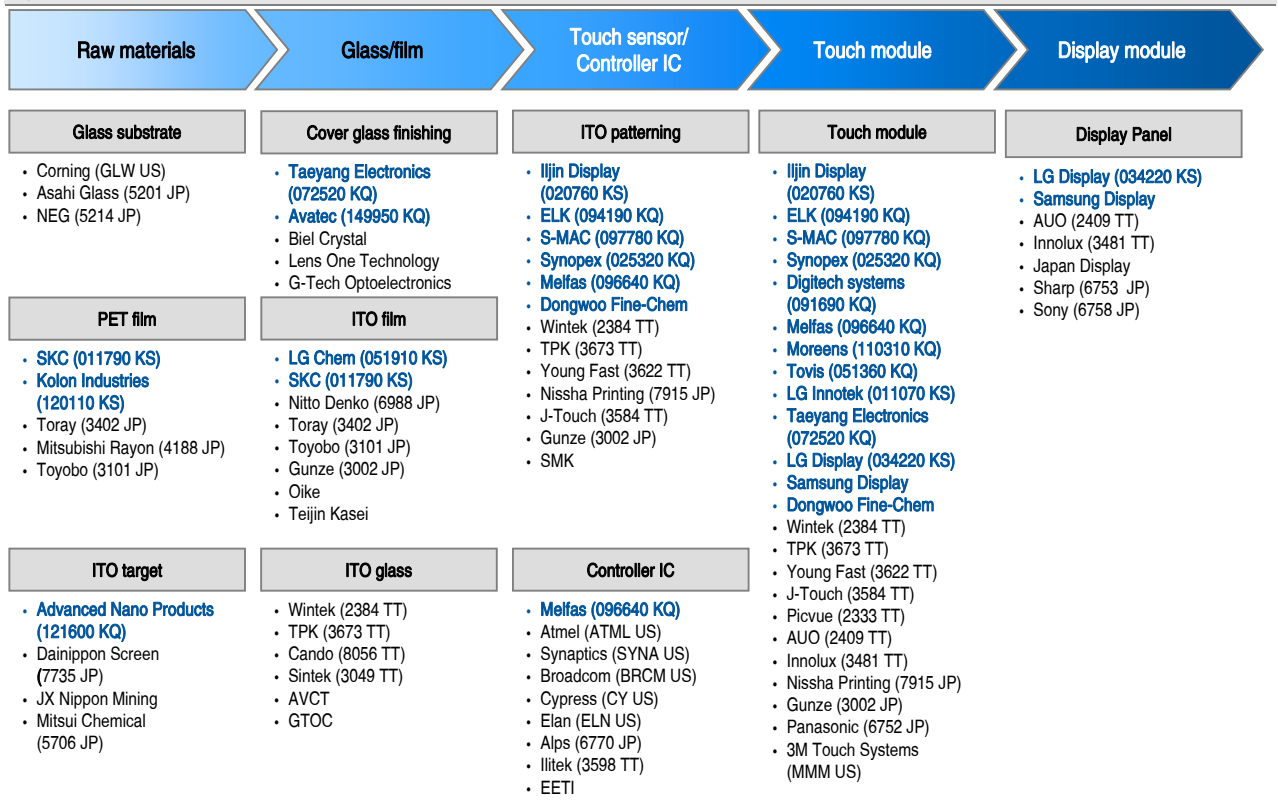
1. Competitive supply chain

There is a plethora of touchscreen-related players, making investments in the touchscreen industry difficult. The supply chain of the touchscreen industry is divided into: 1) raw materials, 2) glass and film, 3) touch sensors and controller ICs, 4) module assembly, and 5) display panels. Core raw materials, such as glass substrates, PET films, and ITO targets, have been largely driven by Japanese makers. These markets, which have high barriers to entry, are not characterized by intense competition and generate value added. Among Korean makers, SKC and Kolon Industries produce optical PET base film, while Advanced Nano Products supplies ITO targets to touchscreen and solar PV makers at home and abroad.

The cover glass market is currently dominated by Chinese makers (Biel Crystal, Lens One, G-Tech, etc.), as it is labor-intensive and characterized by a poor working environment. Among Korean makers, Taeyang Electronics and Avatec have capacity of 1.5mn sheets/month (based on 4-inch glass) and 150,000 sheets/month (based on 10-inch glass), respectively. Cover glass suppliers are taking on more importance, as demand for OGS is rising.

The ITO film and ITO glass markets are also being driven by overseas makers. The touchscreen ITO film market is dominated by Nitto Denko (Japan) with a market share of 80%. Among Korean makers, SKC and LG Chem have recently advanced into the ITO film market. Film-type touchscreen modules are mostly produced by Korean and Japanese makers. Taiwanese makers are driving glass-type touchscreen technologies. Existing LCD color filter makers, including Wintek, TPK, Cando, and Sintek, produce ITO glass and sensors. Touchscreen controller ICs are driven by US makers which have strength in the system semiconductor segment. Domestic touchscreen controller IC makers include Melfas, Zinitix, and Imagis. In the sensor patterning and module assembly markets, more than 100 makers, including about 20 Korean makers, are locked in intense competition.

Figure 62. Touchscreen supply chain



Source: KDB Daewoo Securities Research

2. Supply chains by product

The supply chains of touchscreen products vary by technology. Apple adopted GG (DITO) in the first iPhone and stuck with the technology through the iPhone 4S before switching to in-cell for the iPhone 5. While Taiwanese producers (such as TPK, Wintek, and Innolux) mostly supply glass sensors for use in GG-based products, in-cell glass sensors are provided by panel makers including LGD, Japan Display, and Sharp. SEC's Galaxy products are based on the on-cell technology and OLED. Mid- and low-end smartphones have mostly adopted film technology, and G2 technology is becoming increasingly popular.

Most tablet PCs (7-11 inch) are based on film technology, though the iPad (excluding the iPad mini) and Kindle are based on GG. Domestic touchscreen production is largely based on film technology. Taiwan-based Young Fast and J Touch, as well as Japan-based Nissha Printing, are dominant in the film-based touchscreen market.

As for laptop computers (11-15 inch) and PC monitors (17-24 inch), G2 (OSG) is the most preferred technology of touchscreen producers. But some products are based on metal mesh technology. Chinese and Taiwanese producers took the lead in the G2 segment, capitalizing on their advanced glass sensor technology.

Table 15. Touchscreen and display panel suppliers of major mobile devices

Company	Product	Screen size	Resolution	Touchscreen type	Touchscreen supplier	Display panel supplier
Amazon	Kindle Fire 7	7.0"	1024 x 600	GG (SITO)	Wintek	LGD
	Kindle Fire 7 HD	7.0"	1280 x 800	GG (SITO)	TPK HannsTouch Innolux	LGD Panasonic LCD Innolux
	Kindle Fire 8.9 HD	8.9"	1920 x 1200	GG (SITO)	TPK	LGD Panasonic LCD
Apple	iPhone 4S	3.5"	960 x 640	GG (DITO)	TPK Wintek Innolux	LGD Japan Display Sharp
	iPhone 5	4.0"	1136 x 640	In-cell	LG Display Japan Display Sharp	LGD Japan Display Sharp
	New iPad	9.7"	2048 x 1536	GG (DITO)	TPK Wintek Innolux	LGD Samsung Display
	iPad mini	7.9"	1024 x 768	GF2	Nissha Printing	LGD AUO
Google	Nexus 7	7.0"	1280 x 800	G2 (OGS)	TPK Wintek	Hydis HannStar
	Nexus 7	7.0"	1280 x 800	GFF	O-Film	BOE HannStar
Lenovo	IdeaPad	11.6"	1366 x 768	GFF	O-Film	AUO
Microsoft	Surface	10.6"	1366 x 768	G1F	Young Fast J Touch TPK	Samsung Display
	Surface Pro	10.6"	1920 x 1080	G1F	Young Fast J Touch LG Display	LGD Samsung Display
SEC	Galaxy S4	5.0"	1920 x 1080	On-cell	Dongwoo Fine-Chem HannsTouch CPT	Samsung Display
	Galaxy Note II	5.5"	1280 x 720	On-cell	Dongwoo Fine-Chem HannsTouch CPT	Samsung Display
	Galaxy Tablet	7.0/10.1"	1280 x 800	GFF	Iljin Display S-MAC ELK	Samsung Display
	Galaxy S Duos	4.0"	800 x 480	G1F	Melfas	Samsung Display
	Series 7 AIO PC	23.5"	1920 x 1080	Metal mesh	MNTech	Samsung Display
LG	Optimus G	4.7"	1280 x 768	G2 (OGS)	LG Innotek TPK	LGD
	Optimus G Pro	5.5"	1920 x 1080	GFF	LG Innotek	LGD
Pantech	Vega Iron	5.0"	1920 x 1080	In-cell	Japan Display	Japan Display

Source: DisplaySearch, KDB Daewoo Securities Research

3. Cost analysis

Cover glass expenses represent the largest portion (30-40%) of touchscreen production costs. This figure is roughly 45-73% for G1F and G2 technologies. In particular, G2-based cover glass expenses account for a whopping 70% of overall costs due to the fact that the technology eliminates the need for ITO sensors and lamination. In other words, costs vary significantly depending on yields of the cover glass sensor patterning process.

As for smartphone-use touchscreens, GFF-based models cost the least for now. As such, except for high-end in-cell/on-cell products, most touchscreens are produced using GFF. Indeed, GFF is best suited for mid- to low-end products due to its inferior optical features and thickness. The cost efficiency of G2-based smartphone touchscreens improves when the screens are 10-inch-or-larger (assuming the same production yield).

Table 16. Cost analysis of 3.5" touchscreen (assuming yield of 85%) (US$, %)

	Detail	GG		GFF		G1F		G2	
		Amount	Proportion	Amount	Proportion	Amount	Proportion	Amount	Proportion
Variable costs	Cover glass (Soda-lime)	3.5	35%	3.5	39%	5.9	54%	7.4	69%
	Controller IC & FPCB	1.6	16%	1.6	18%	1.6	15%	1.6	15%
	ITO sensor	2.0	20%	1.5	17%	1.0	9%	0.0	0%
	OCA & lamination	1.5	15%	1.0	11%	0.8	7%	0.0	0%
	Other	0.6	6%	0.6	7%	0.8	7%	1.1	10%
	Subtotal	9.2	93%	8.2	92%	10.1	93%	10.1	94%
Fixed costs	Labor , logistics, R&D, utilities, and SG&A costs	0.7	7%	0.7	8%	0.7	7%	0.7	6%
Total		**9.9**	**100%**	**8.9**	**100%**	**10.8**	**100%**	**10.8**	**100%**

Source: DisplayBank, KDB Daewoo Securities Research

Table 17. Cost analysis of 4.3" touchscreen (assuming yield of 85%) (US$, %)

	Detail	GG		GFF		G1F		G2	
		Amount	Proportion	Amount	Proportion	Amount	Proportion	Amount	Proportion
Variable costs	Cover glass (Soda-lime)	5.0	41%	5.0	45%	7.7	58%	9.6	73%
	Controller IC & FPCB	1.8	15%	1.8	16%	1.8	14%	1.8	14%
	ITO sensor	2.5	21%	2.0	18%	1.5	11%	0.0	0%
	OCA & lamination	1.5	12%	1.0	9%	0.8	6%	0.0	0%
	Other	0.6	5%	0.6	5%	0.8	6%	1.1	8%
	Subtotal	11.4	94%	10.4	94%	12.6	95%	12.5	95%
Fixed costs	Labor , logistics, R&D, utilities, and SG&A costs	0.7	6%	0.7	6%	0.7	5%	0.7	5%
Total		**12.1**	**100%**	**11.1**	**100%**	**13.3**	**100%**	**13.2**	**100%**

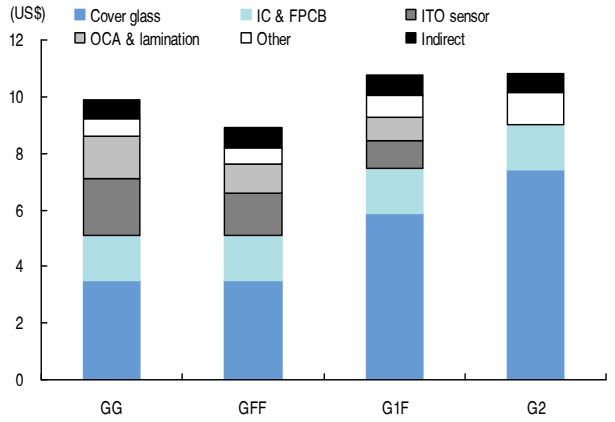
Source: DisplayBank, KDB Daewoo Securities Research

Table 18. Cost analysis of 10.1" touchscreen (assuming yield of 85%) (US$, %)

	Detail	GG		GFF		G1F		G2	
		Amount	Proportion	Amount	Proportion	Amount	Proportion	Amount	Proportion
Variable costs	Cover glass (Soda-lime)	12.0	31%	12.0	34%	18.0	45%	22.5	67%
	Controller IC & FPCB	7.5	19%	7.5	21%	7.5	19%	7.5	22%
	ITO sensor	10.0	26%	9.0	25%	8.0	20%	0.0	0%
	OCA & lamination	6.0	16%	4.0	11%	3.0	7%	0.0	0%
	Other	1.0	3%	1.0	3%	1.3	3%	1.4	4%
	Subtotal	36.5	94%	33.5	94%	37.8	95%	31.4	93%
Fixed costs	Labor , logistics, R&D, utilities, and SG&A costs	2.2	6%	2.2	6%	2.2	5%	2.2	7%
Total		**38.7**	**100%**	**35.7**	**100%**	**40.0**	**100%**	**33.6**	**100%**

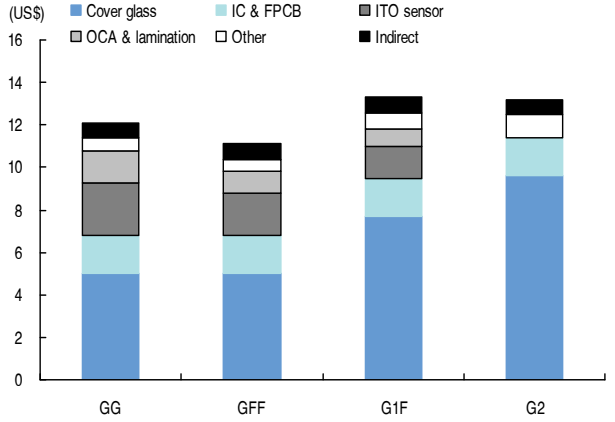
Source: DisplayBank, KDB Daewoo Securities Research

Figure 63. Cost breakdown of smartphone touchscreen (3.5", soda-lime glass)



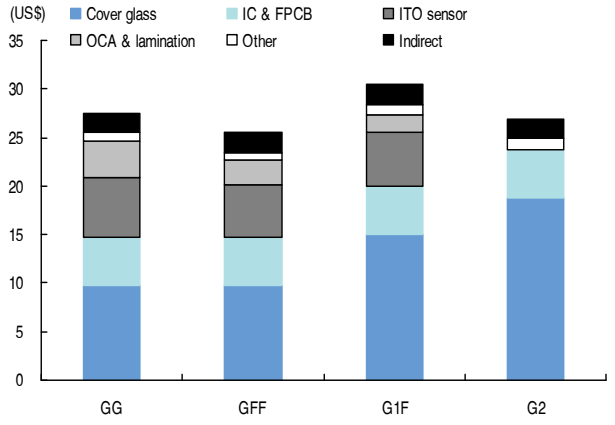
Source: DisplayBank, KDB Daewoo Securities Research

Figure 64. Cost breakdown of smartphone touchscreen (4.3", Gorilla Glass)



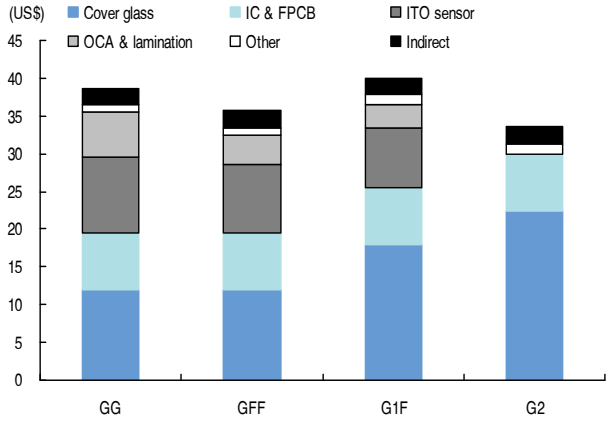
Source: DisplayBank, KDB Daewoo Securities Research

Figure 65. Cost breakdown of tablet PC touchscreen (8.0", Gorilla Glass)



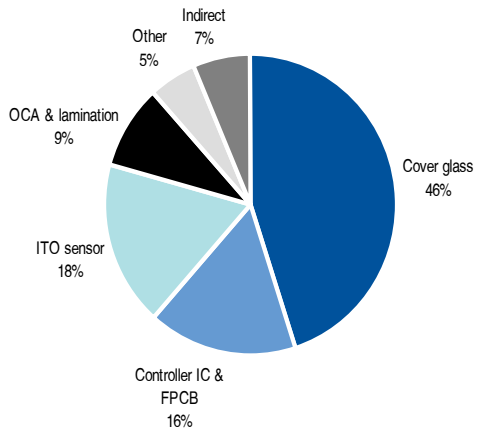
Source: DisplayBank, KDB Daewoo Securities Research

Figure 66. Cost breakdown of tablet PC touchscreen (10.1", Gorilla Glass)



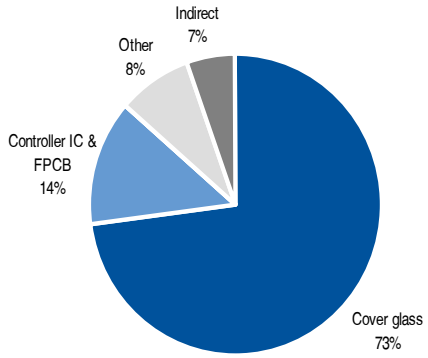
Source: DisplayBank, KDB Daewoo Securities Research

Figure 67. Cost breakdown of GFF-type touchscreen (4.3", Gorilla Glass)



Source: DisplayBank, KDB Daewoo Securities Research

Figure 68. Cost breakdown of G2-type touchscreen (4.3", Gorilla Glass)



Source: DisplayBank, KDB Daewoo Securities Research

V. Investment strategy and valuations

1. Maintain Overweight; Top picks: Samsung SDI, ELK, and Melfas

Up to this point, only small- and medium-sized panel producers have engaged in the touchscreen business. Smartphone- and tablet PC-specific touchscreens require customization, as: 1) their cover glass designs are unique, 2) they must feature cutouts for cameras and speakers, and 3) they must accommodate various bezel colors and logos. This need to produce multiple items in small volumes made the touchscreen business optimal for small manufacturers. However, the market has recently experienced changes. Large panel makers, as well as LCD color filter producers, are entering the market due to: 1) their need for new growth drivers amid the LCD industry slowdown, 2) a surge in 10-inch-or-larger touchscreen demand, and 3) ongoing standardization attempts for touchscreens. In particular, standardization would be positive for big players with large production facilities, since it would enable the mass production of a small number of items.

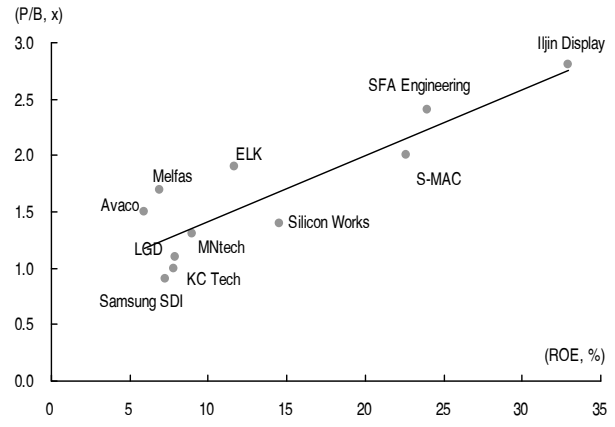
Although the smartphone- and tablet PC-use touchscreen market is likely to grow, fierce competition should hamper margin improvement. We take note of potential growth for large-sized touchscreens (larger than laptop panels). In addition, we believe PDP lines could be converted to produce touchscreens. We maintain our Overweight rating on the display sector and select as our top picks Samsung SDI, which is seeing its loss-making units turn around rapidly, ELK, which is a supplier for global PC makers, and Melfas, which is likely to expand its customer base and achieve ASP increases.

Table 19. Ratings and key metrics of display companies in the KDB Daewoo universe

Company	Rating	TP	CP	Upside	P/E (x)			P/B (x)			EPS growth (%)			ROE (%)		
		(W)	(W)	(%)	12	13F	14F	12	13F	14F	12	13F	14F	12	13F	14F
Samsung SDI	Buy	180,000	143,500	25	4.8	12.3	9.3	1.0	0.9	0.9	360	-63	32	21.8	7.3	9.3
ELK	Buy (Initiate)	22,000	15,000	47	-	17.2	7.6	2.8	1.9	1.5	TTR	TTB	127	-7.8	11.7	21.3
Melfas	Buy (Initiate)	25,000	16,700	50	34.3	26.5	9.2	2.9	1.7	1.5	-10	-20	188	9.2	6.9	17.6
SFA Engineering	Buy	80,000	62,700	28	11.9	11.3	9.3	2.1	2.4	2.0	-20	40	22	19.6	24.0	24.0
Silicon Works	Buy	29,000	25,100	16	8.7	10.4	8.7	1.4	1.4	1.3	26	-6	20	17.6	14.5	15.5
KC Tech	Buy	5,800	5,630	3	12.1	12.4	10.8	0.7	1.0	0.9	-21	49	15	5.5	7.8	8.3
Avaco	Buy	9,000	7,010	28	-	22.0	9.8	1.1	1.5	1.5	TTR	TTB	126	-0.2	5.9	13.2
LG Display	Trading Buy	34,000	31,450	8	47.6	13.4	14.6	1.1	1.1	1.0	-130	261	-8	2.3	7.9	6.9
Iljin Display	Trading Buy (Initiate)	22,000	18,200	21	9.4	8.8	9.8	4.5	2.8	2.2	104	-12	-10	53.3	32.9	23.0
S-MAC	Trading Buy (Initiate)	18,000	15,250	18	10.8	9.7	7.7	2.7	2.0	1.6	-30	2	26	28.1	22.6	22.9
MNtech	Trading Buy	13,000	10,900	19	10.6	14.5	12.9	1.5	1.3	1.2	223	-32	12	14.8	9.0	9.4

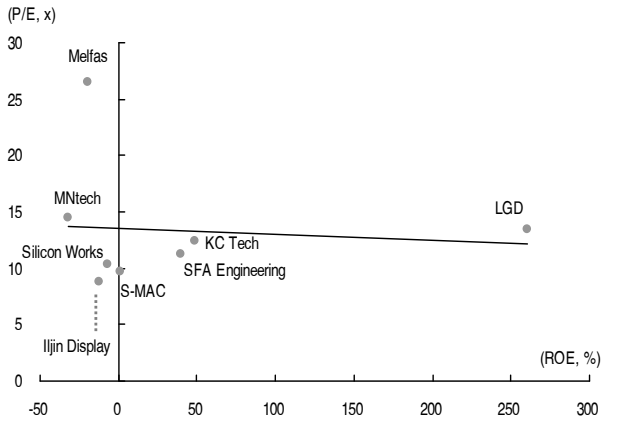
Source: KDB Daewoo Securities Research

Figure 69. P/B-ROE comparison of display firms in the KDB Daewoo universe (2013F)



Source: KDB Daewoo Securities Research

Figure 70. EPS growth-P/E comparison of display firms in the KDB Daewoo universe (2013F)



Source: KDB Daewoo Securities Research

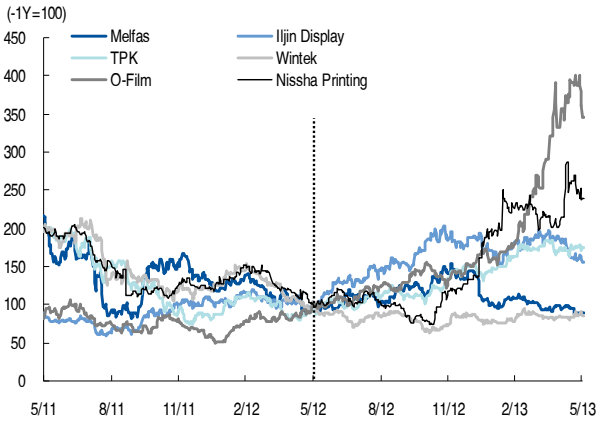
2. Comparisons with global touchscreen peers

Table 20. Key metrics of global touchscreen firms (Wbn, %, x)

	Mkt. cap	Revenue		OP		NP		ROE		P/E		P/B		EV/EBITDA	
		13F	14F	13F	14F	13F	14F	13F	14F	13F	14F	13F	14F	13F	14F
Atmel	3,817	1,614	1,769	111	280	25	187	2.6	12.6	24.3	13.3	3.5	3.1	17.0	8.5
Cypress	1,871	860	947	86	138	-27	42	19.1	68.8	26.3	14.6	12.7	12.6	17.4	11.6
Synaptics	1,517	857	927	163	194	100	128	21.2	20.5	12.6	10.6	2.3	1.9	6.8	5.9
TPK	7,376	8,031	9,516	969	1,106	723	817	37.2	33.3	10.5	9.3	3.4	2.8	6.4	5.5
Wintek	1,054	3,257	3,371	-46	-19	-73	-21	-6.4	-3.0	-	-	0.8	0.9	10.0	7.3
Young Fast	324	504	628	17	13	17	16	3.9	4.0	19.1	21.6	0.8	0.8	3.3	2.7
O-Film	4,148	1,125	1,558	102	140	87	119	25.3	23.9	46.0	34.9	7.7	5.9	25.5	18.6
Laibao	2,929	505	803	73	111	67	97	11.4	14.2	42.7	27.7	4.5	3.9	18.2	10.3
Truly	2,056	2,324	2,694	216	249	118	123	16.1	16.5	13.7	12.1	2.1	2.1	9.4	8.8
Nitto Denko	11,976	8,626	9,172	1,157	1,294	805	894	13.9	14.0	14.2	12.7	1.8	1.7	6.2	5.6
Nissha Printing	922	1,418	1,547	83	115	65	91	12.8	15.1	13.4	9.5	1.6	1.4	4.2	3.9
Avg.								14.3	20.0	22.3	16.6	3.8	3.4	11.3	8.1

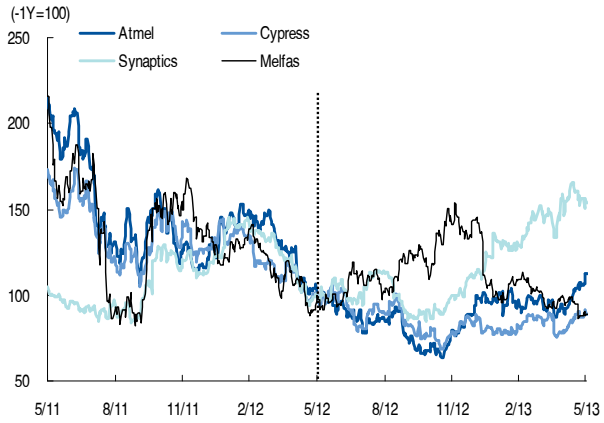
Source: Bloomberg, KDB Daewoo Securities Research

Figure 71. Share performances of global touchscreen makers (2013F)



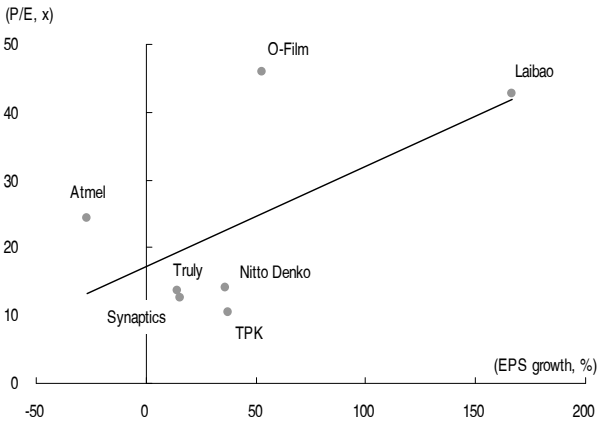
Source: Bloomberg, KDB Daewoo Securities Research

Figure 72. Share performances of global touchscreen controller IC makers (2013F)



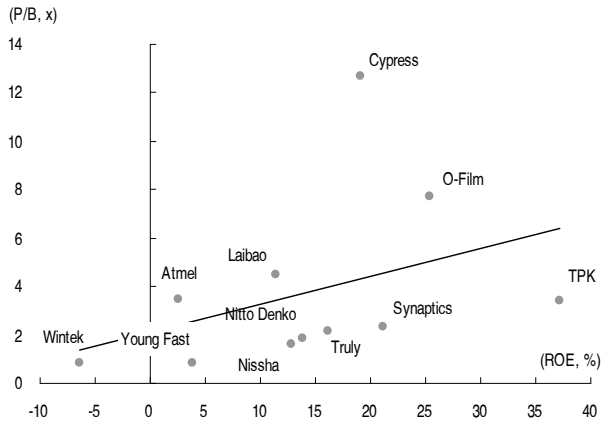
Source: Bloomberg, KDB Daewoo Securities Research

Figure 73. EPS growth-P/E comparison of global touchscreen makers (2013F)



Source: Bloomberg, KDB Daewoo Securities Research

Figure 74. P/B-ROE comparison of global touchscreen makers (2013F)



Source: Bloomberg, KDB Daewoo Securities Research

Samsung SDI (006400 KS)

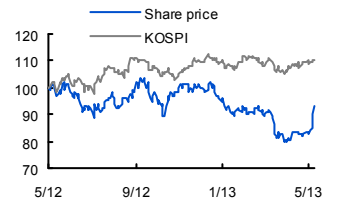
Turning a corner

Display

(Maintain)	Buy
Target Price (12M, W)	180,000
Share Price (05/31/13, W)	143,500
Expected Return	25%

OP (13F, Wbn)	146
Consensus OP (13F, Wbn)	126
EPS Growth (13F, %)	-62.7
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	11.9
Market P/E (13F, x)	9.6
KOSPI	2,001.05
Market Cap (Wbn)	6,538
Shares Outstanding (mn)	47
Free Float (%)	74.6
Foreign Ownership (%)	22.7
Beta (12M)	0.87
52-Week Low (W)	120,500
52-Week High (W)	161,500

(%)	1M	6M	12M
Absolute	11.7	-7.7	-6.2
Relative	9.8	-11.3	-14.8



2H outlook: Share performance hinges on recovery of loss-making units

In 1Q, excluding the small- to medium-sized rechargeable battery division (which generated a W55bn profit), Samsung SDI's business units reported a combined loss of W88bn. While the growth trajectory of the small- to medium-sized rechargeable battery business is undeniably important, we believe the stock's performance will be dependent on the recovery of the firm's loss-making units (ESS, EV, PDP, and solar PV).

Catalysts: 1) Nuclear reactor suspension, 2) BMW i3, 3) PDP line conversion

ESS: The recent discovery that defective parts were used in nuclear power plants caused 10 of the nation's 23 nuclear reactors to be shut down. This is equivalent to 7.72mn kW, or 37% of current aggregate power capacity (20.7mn kW). Fears of power shortages in June, typically a high-demand season, are growing, with some reports suggesting the situation may take a severe turn for the worse in August. Against this backdrop, the need for energy storage systems (ESS) has been increasing as a hedge against potential power shortages and blackouts. Until end-2012, Samsung SDI supplied mostly household ESS (5-10kWh), but, since earlier this year, the firm has been supplying commercial ESS as well (1-10MWh). We forecast W100bn in ESS revenue for 2013, and the company aims to break even by year-end. We expect ESS losses to narrow from 2Q.

EV: Tesla Motors' share price recently broke above US$100 from US$34 earlier this year, as the firm's return to profit in 1Q raised expectations over the growth of electric vehicles (EV). The Tesla Model S, which uses Panasonic's cylindrical batteries (7,000 cells/vehicle), could tighten the cylindrical battery market by around 10% in 2H. Since April, Samsung SDI has begun mass producing EV batteries for BMW's i3 (to be released in September; exclusive supply).

PDP: The company has no plans to downsize its PDP business this year, but intends to gradually convert its production lines beginning in 2014. However, we believe PDPs are becoming obsolete more quickly than expected, suggesting the company may review its medium- to long-term conversion plans earlier than scheduled. We think existing PDP lines would be best suited for manufacturing solar cells. However, given the persistent supply glut of the solar industry, solar cells are not in high demand. The next best candidate would be touchscreens. The lines' existing deposition, exposure and etching equipment can be used for manufacturing touchscreens, and the offset printing process for PDP electrodes is also similar to that for printing touchscreen electrodes.

Valuation: Maintain Buy with TP of W180,000

We reiterate our Buy rating on Samsung SDI with a target price of W180,000. The stock has pulled back nearly 19% YTD as a result of 1Q earnings weakness. From 2Q, we see shipment growth and improved margins in rechargeable batteries, driven by the release of the Galaxy S4. For 2Q, we forecast revenue at W1.4tr (+19% QoQ, -3% YoY) and operating profit at W38bn. At a P/B of 0.8x, we see the current valuation as an attractive entry point.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	5,124	5,444	5,771	5,855	6,393	6,975
OP (Wbn)	287	110	187	146	292	437
OP Margin (%)	5.6	2.0	3.2	2.5	4.6	6.3
NP (Wbn)	356	320	1,472	548	725	907
EPS (W)	7,548	6,785	31,192	11,625	15,366	19,227
ROE (%)	6.5	5.3	21.8	7.3	9.3	11.0
P/E (x)	22.3	19.7	4.8	11.9	9.0	7.2
P/B (x)	1.3	1.0	1.0	0.9	0.8	0.8

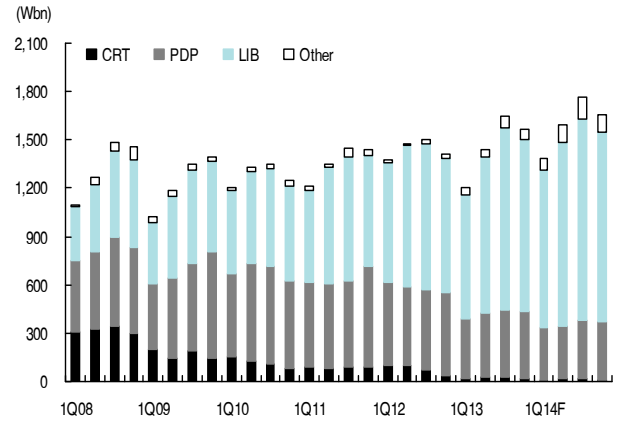
Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

Table 21. Quarterly and annual earnings (under consolidated K-IFRS)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Shipment (mn units)											
CRT	0.7	0.9	0.8	0.7	0.4	0.5	0.5	0.4	3.0	1.8	1.1
PDP	1.5	1.6	1.7	1.7	1.4	1.4	1.5	1.5	6.5	5.9	5.3
Rechargeable battery	274	327	375	351	332	389	409	384	1,327	1,514	1,636
ASP (US$)											
CRT	29	29	29	28	28	28	28	27	29	28	28
PDP	226	232	230	227	221	218	220	218	229	219	208
Rechargeable battery	2.6	2.7	2.8	2.9	2.8	2.8	2.9	2.9	2.8	2.8	2.8
Revenue (Wbn)	1,208	1,437	1,648	1,562	1,383	1,590	1,765	1,655	5,855	6,393	6,975
CRT	22	29	23	20	13	17	14	12	94	54	32
PDP	368	397	420	414	319	329	363	360	1,599	1,371	1,172
Rechargeable battery	772	970	1,130	1,069	977	1,144	1,249	1,177	3,942	4,547	4,946
Other (EV, ESS, solar)	46	41	75	59	75	101	138	107	220	421	825
Operating profit (Wbn)	-33	38	87	53	30	69	114	78	145	291	437
CRT	-4	-2	0	0	0	0	0	0	-6	0	0
PDP	-21	1	5	4	-5	-2	-2	-2	-10	-11	-9
Rechargeable battery	55	89	122	84	75	102	141	102	350	420	492
Other	-64	-50	-40	-35	-40	-30	-25	-23	-189	-118	-47
OP margin (%)	-2.8	2.7	5.3	3.4	2.2	4.4	6.5	4.7	2.5	4.6	6.3
CRT	-18.0	-8.0	0.5	0.5	0.5	0.5	0.5	0.5	-6.5	0.5	0.5
PDP	-5.6	0.4	1.3	0.9	-1.6	-0.8	-0.6	-0.4	-0.6	-0.8	-0.8
Rechargeable battery	7.1	9.2	10.8	7.9	7.7	8.9	11.3	8.7	8.9	9.2	10.0
Net profit (Wbn)	78	130	187	153	109	179	235	203	548	725	907
Equity-method gains	100	130	156	146	101	153	180	175	532	608	699
Net margin (%)	6.4	9.1	11.4	9.8	7.9	11.2	13.3	12.2	9.4	11.3	13.0
EBITDA (Wbn)	91	170	220	187	175	208	262	222	669	868	1,051
EBITDA margin (%)	7.6	11.9	13.3	12.0	12.6	13.1	14.9	13.4	11.4	13.6	15.1
Growth (QoQ/YoY)											
Shipments (%)											
CRT	-36.4	30.5	-17.6	-12.3	-36.4	30.5	-17.6	-12.3	-67.6	-40.0	-40.0
PDP	-21.1	4.2	9.4	0.0	-20.6	4.2	9.4	0.0	-7.7	-9.5	-10.0
Rechargeable battery	3.2	19.4	14.4	-6.1	-5.5	17.1	5.0	-6.0	21.2	14.1	8.1
ASP (%)											
CRT	-12.1	-0.5	-0.1	-2.7	1.3	-0.5	-0.1	-2.7	-1.0	-2.0	-2.0
PDP	-9.2	2.5	-1.0	-1.0	-3.0	-1.0	1.0	-1.0	-11.1	-4.1	-5.0
Rechargeable battery	-9.3	4.2	4.1	1.3	-3.4	0.0	4.0	0.2	1.6	2.3	0.6
Revenue (%)	-14.6	18.9	14.7	-5.2	-11.4	15.0	11.0	-6.2	1.4	9.2	9.1
CRT	-44.4	31.1	-19.6	-15.0	-35.5	29.8	-17.7	-14.6	-69.4	-42.0	-41.2
PDP	-28.7	7.9	5.8	-1.5	-23.0	3.1	10.5	-1.0	-21.2	-14.3	-14.5
Rechargeable battery	-6.8	25.7	16.5	-5.4	-8.6	17.0	9.2	-5.7	17.7	15.4	8.8
Other (EV, ESS, solar)	53.6	-12.3	84.9	-21.8	27.3	35.7	36.8	-23.1	153.6	91.1	96.2
Operating profit (%)	TTR	TTB	129.3	-39.1	-43.1	129.0	64.4	-31.6	-22.2	100.5	49.8
CRT	RIR	RIR	TTB	-15.0	-35.5	29.8	-17.7	-14.6	RIR	TTB	-41.2
PDP	TTR	TTB	266.2	-28.5	TTR	RIR	RIR	RIR	TTR	RIR	RIR
Rechargeable battery	-3.4	62.2	37.0	-30.9	-10.7	35.2	38.8	-27.8	8.9	20.1	17.2
Other (EV, ESS, solar)	RIR	RIR	RIR	RIR	RIR	RIR	RIR	RIR	RIR	RIR	RIR
Net profit (%)	39.5	67.3	44.1	-18.1	-29.0	64.1	31.2	-13.6	-62.7	32.2	25.1
Equity-method gains	-25.7	30.5	19.2	-6.4	-30.6	51.0	18.1	-2.9	17.6	14.5	14.9
EBITDA (%)	-47.1	86.6	29.1	-14.8	-6.6	18.8	26.2	-15.3	-7.4	29.7	21.1

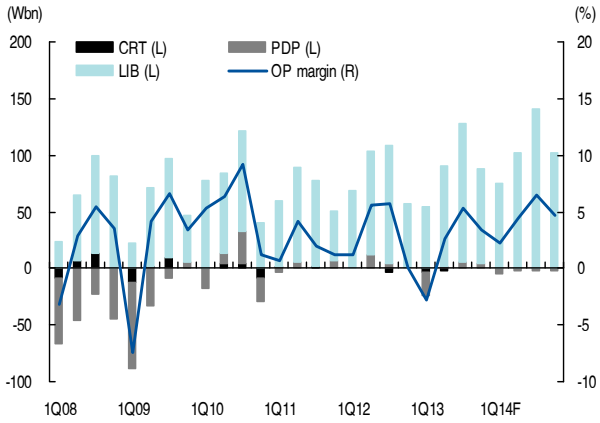
Note: "TTB," "TTR," and "RR" refer to "turning to black," "turning to red," and "remaining red," respectively.
Source: Company data, KDB Daewoo Securities Research

Figure 75. Consolidated revenue



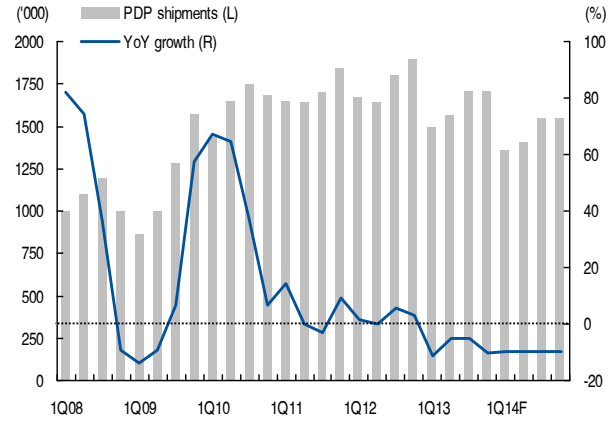
Source: Company data, KDB Daewoo Securities Research

Figure 76. Consolidated operating profit



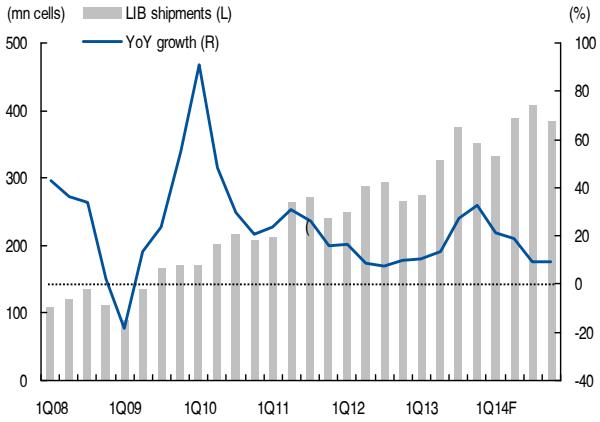
Source: Company data, KDB Daewoo Securities Research

Figure 77. PDP shipments



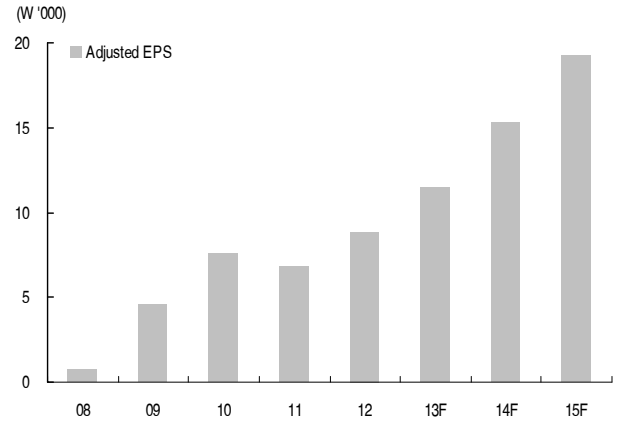
Source: Company data, KDB Daewoo Securities Research

Figure 78. LIB shipments



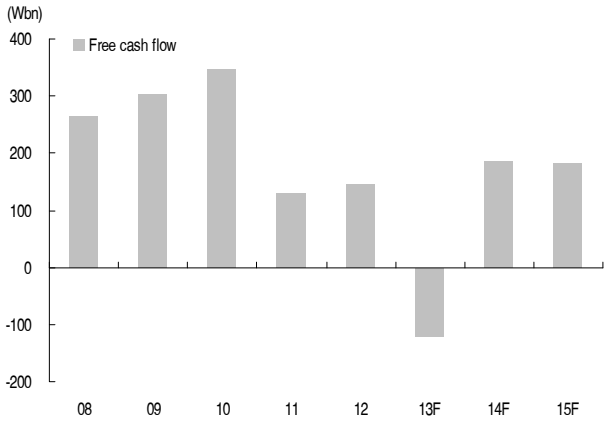
Source: Company data, KDB Daewoo Securities Research

Figure 79. Adjusted EPS



Source: KDB Daewoo Securities Research

Figure 80. Free cash flow



Source: KDB Daewoo Securities Research

Samsung SDI (006400 KS/TP: W180,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**5,771**	**5,855**	**6,393**	**6,975**
Cost of Sales	**4,863**	**4,927**	**5,222**	**5,588**
Gross Profit	**908**	**927**	**1,172**	**1,387**
SG&A Expenses	**721**	**782**	**880**	**950**
Operating Profit (Adj)	**187**	**146**	**292**	**437**
Operating Profit	**187**	**146**	**292**	**437**
Non-Operating Profit	**1,843**	**574**	**648**	**739**
Net Financial Income	4	19	23	23
Net Gain from Inv in Associates	2,239	535	608	699
Pretax Profit	2,029	719	940	1,176
Income Tax	543	151	188	235
Profit from Continuing Operations	**1,487**	**569**	**752**	**941**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**1,487**	**569**	**752**	**941**
Controlling Interests	1,472	548	725	907
Non-Controlling Interests	15	21	27	34
Total Comprehensive Profit	**1,325**	**287**	**470**	**659**
Controlling Interests	1,321	270	446	628
Non-Controlling Interests	4	17	24	31
EBITDA	641	656	871	1,053
FCF (Free Cash Flow)	657	-155	138	86
EBITDA Margin (%)	11.1	11.2	13.6	15.1
Operating Profit Margin (%)	3.2	2.5	4.6	6.3
Net Profit Margin (%)	25.5	9.4	11.3	13.0

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**2,415**	**2,675**	**2,733**	**2,730**
Cash and Cash Equivalents	947	1,042	1,004	847
AR & Other Receivables	704	777	824	899
Inventories	559	617	654	713
Other Current Assets	180	199	211	230
Non-Current Assets	**8,480**	**9,126**	**9,808**	**10,762**
Investments in Associates	4,005	4,552	5,160	5,860
Property, Plant and Equipment	1,971	2,250	2,356	2,608
Intangible Assets	171	150	125	107
Total Assets	**10,895**	**11,801**	**12,541**	**13,491**
Current Liabilities	**2,004**	**2,188**	**2,277**	**2,420**
AP & Other Payables	744	822	871	950
Short-Term Financial Liabilities	659	702	702	702
Other Current Liabilities	601	664	704	768
Non-Current Liabilities	**1,327**	**1,835**	**2,083**	**2,303**
Long-Term Financial Liabilities	**474**	**777**	**777**	**777**
Other Non-Current Liabilities	810	993	1,219	1,440
Total Liabilities	**3,331**	**4,022**	**4,359**	**4,723**
Controlling Interests	**7,373**	**7,576**	**7,954**	**8,511**
Capital Stock	**241**	**241**	**241**	**241**
Capital Surplus	1,258	1,259	1,259	1,259
Retained Earnings	4,987	5,462	6,119	6,954
Non-Controlling Interests	**191**	**203**	**227**	**258**
Stockholders' Equity	**7,565**	**7,779**	**8,182**	**8,768**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**565**	**528**	**690**	**788**
Net Profit	1,487	569	752	941
Non-Cash Income and Expense	-833	111	119	112
Depreciation	424	480	554	598
Amortization	31	31	25	18
Others	-415	33	81	82
Chg in Working Capital	-8	-22	7	-29
Chg in AR & Other Receivables	110	-19	-47	-75
Chg in Inventories	2	-46	-37	-60
Chg in AP & Other Payables	36	-17	49	79
Income Tax Paid	-81	-131	-188	-235
Cash Flows from Inv Activities	**-473**	**-745**	**-625**	**-832**
Chg in PP&E	-418	-760	-660	-850
Chg in Intangible Assets	0	0	0	0
Chg in Financial Assets	0	0	0	0
Others	-55	15	35	18
Cash Flows from Fin Activities	**88**	**294**	**-103**	**-113**
Chg in Financial Liabilities	187	324	0	0
Chg in Equity	2	1	0	0
Dividends Paid	-76	-67	-67	-72
Others	-25	-31	-36	-42
Increase (Decrease) in Cash	**189**	**95**	**-38**	**-157**
Beginning Balance	758	947	1,042	1,004
Ending Balance	947	1,042	1,004	847

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	4.8	11.9	9.0	7.2
P/CF (x)	3.7	6.2	5.0	4.3
P/B (x)	1.0	0.9	0.8	0.8
EV/EBITDA (x)	11.5	10.8	8.2	7.0
EPS (W)	31,192	11,625	15,366	19,227
CFPS (W)	40,827	22,439	27,642	32,287
BPS (W)	156,232	160,967	169,515	181,691
DPS (W)	1,500	1,500	1,600	1,800
Payout ratio (%)	4.6	12.3	9.9	8.9
Dividend Yield (%)	1.0	1.1	1.2	1.3
Revenue Growth (%)	6.0	1.5	9.2	9.1
EBITDA Growth (%)	16.9	2.2	32.8	20.9
Operating Profit Growth (%)	69.9	-22.1	100.3	49.8
EPS Growth (%)	359.7	-62.7	32.2	25.1
Accounts Receivable Turnover (x)	7.9	8.3	8.4	8.5
Inventory Turnover (x)	10.1	10.0	10.1	10.2
Accounts Payable Turnover (x)	10.9	9.8	9.9	10.1
ROA (%)	15.3	5.0	6.2	7.2
ROE (%)	21.8	7.3	9.3	11.0
ROIC (%)	5.4	4.7	8.7	12.2
Liability to Equity Ratio (%)	44.0	51.7	53.3	53.9
Current Ratio (%)	120.5	122.3	120.0	112.8
Net Debt to Equity Ratio (%)	2.1	5.1	5.3	6.7
Interest Coverage Ratio (x)	7.6	4.1	7.0	10.5

Source: Company data, KDB Daewoo Securities Research estimates

ELK (094190 KQ)

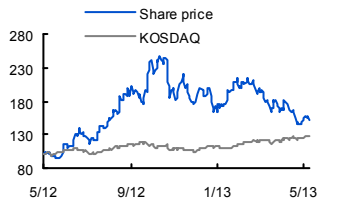
Ready for mass production

Display

(Initiate)	Buy
Target Price (12M, W)	22,000
Share Price (05/31/13, W)	15,000
Expected Return	47%

OP (13F, Wbn)	16
Consensus OP (13F, Wbn)	43
EPS Growth (13F, %)	TTB
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	13.3
Market P/E (13F, x)	9.6
KOSDAQ	577.87
Market Cap (Wbn)	209
Shares Outstanding (mn)	14
Free Float (%)	78.8
Foreign Ownership (%)	5.5
Beta (12M)	0.43
52-Week Low (W)	9,260
52-Week High (W)	25,250

(%)	1M	6M	12M
Absolute	-13.5	-26.8	50.0
Relative	-15.4	-30.4	41.5



2H outlook: G2 (OGS) and metal mesh to become mainstream for notebooks

We believe that OGS and metal mesh technologies can resolve the problems arising from the high resistance of ITO in large-sized touchscreens (for notebooks and PCs). As of last year, 52% of notebooks adopted add-on-type touchscreens, while 12% used the OGS type, and 36% relied on other technologies, including metal mesh. OGS demand from notebooks is likely to pick up full swing beginning this year, and, by 2016, 83% of notebooks should be equipped with OGS-based touchscreens. While OGS technology is likely to become mainstream for large-area screens, demand for metal mesh will surely exist due to its low resistance. ELK is getting ready to mass produce both the G2 (OGS) and metal mesh types, possibly starting in 3Q.

Catalysts: 1) G2 (large-sized touch solution) and 2) diversified customer base

As of end-2012, only 2% and 3% of notebook and desktop computers used touchscreens. Given the expected launch of 3rd generation Ultrabook models, as well as the emergence of hybrid PCs and all-in-one PCs, the proportion of PCs featuring touchscreens is likely to soar. We project 13% of laptops (25mn units) and 14% of desktop computers (20mn units) to adopt touchscreens this year. And the touchscreen market is anticipated to grow at a CAGR of 104% by 2016, as 40% of laptop computers (or 89mn units) and 39% of desktop computers (or 56mn units) are expected to adopt touchscreens in 2016.

ELK supplies to global PC makers including Samsung Electronics (SEC) and HP. As such, we believe that the company stands to benefit greatly from rising demand for notebook- and desktop PC-use touch panels. We expect notebook-use touchscreen revenue to surge from W14bn this year to W55.6bn 2014 and to W87.2bn in 2015. Unlike its domestic rivals, ELK has a diversified customer base (domestic and overseas) and product portfolio (products for smartphones and notebooks).

Valuation: Initiate coverage with Buy rating and TP of W22,000

We initiate our coverage of ELK with a Buy call and a target price of W22,000. The company's profitability deteriorated in 1Q due to the low production yields of some products. Earnings recovery is estimated to be slow through 2Q, but momentum should pick up strongly beginning in 3Q, driven by mass production of G2-type (for large-sized screens) and metal mesh-type touch panels (which should start in the quarter). We applied a P/E of 15x to our 12-month forward EPS of W1,450 to calculate our target price.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	239	236	184	388	463	506
OP (Wbn)	23	18	-6	16	33	40
OP Margin (%)	9.6	7.4	-3.3	4.0	7.1	7.8
NP (Wbn)	19	11	-7	12	28	33
EPS (W)	1,503	828	-542	874	1,987	2,326
ROE (%)	29.7	12.1	-7.8	11.7	21.3	20.5
P/E (x)	10.3	17.1	-	13.3	5.9	5.0
P/B (x)	2.4	1.9	2.8	1.5	1.2	1.0

Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

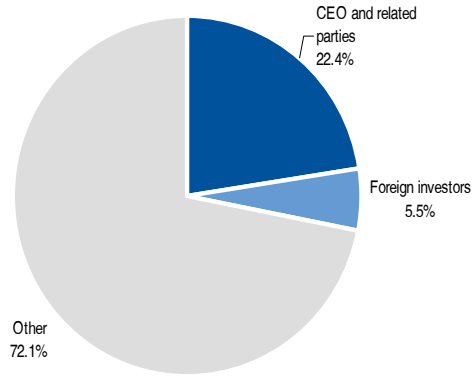
1. Company overview

Established in 1999, ELK got its start by producing backlights for use in LCDs and key pads. In 2007, the company expanded into touchscreens, supplying to mobile handset makers including LG Electronics (LGE) and Motorola. The touchscreen market expanded quickly, but ELK's growth stagnated due to its clients' disappointing smartphone sales.

Last year, ELK secured growth drivers by broadening its customer base to include SEC, HP, Microsoft, and Sony. In addition, the growing contribution of large-sized touchscreens (for tablet PCs and notebooks) should drive the company's revenue and profitability growth beginning this year. Unlike its domestic rivals, ELK has a diversified customer base (domestic and overseas) and product portfolio (products for smartphones and notebooks).

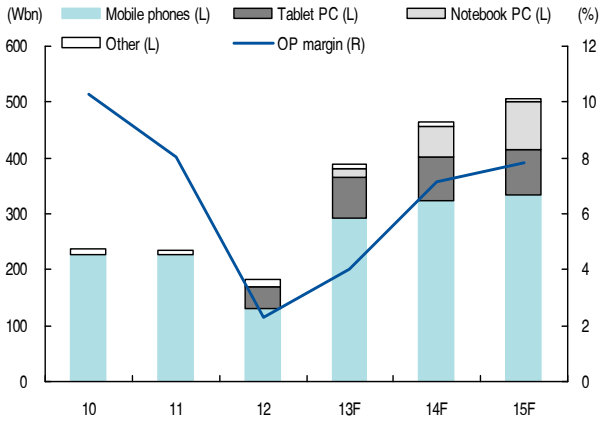
ELK started to release consolidated earnings this year, including the operating results of its Chinese production subsidiary and Dumo Electronics, which produce tempered cover glass. As adoption of G2-type technology increases in large-sized panels, achieving vertical integration should become a key differentiating factor for tempered glass makers.

Figure 81. Ownership structure (1Q13)



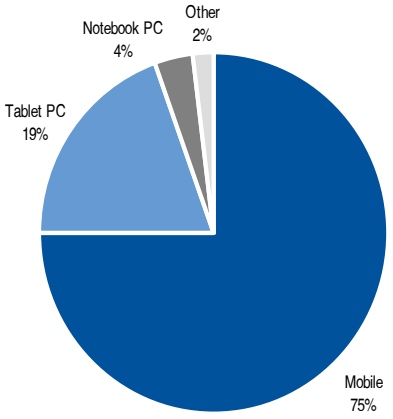
Source: Bloomberg

Figure 82. Annual revenue



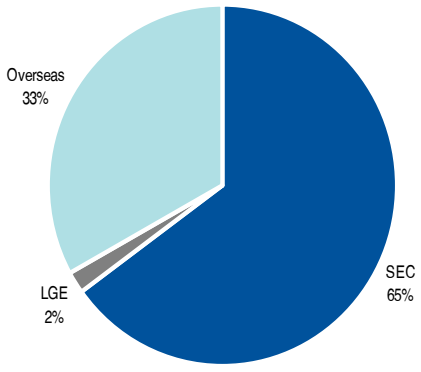
Source: Company data, KDB Daewoo Securities Research

Figure 83. Revenue breakdown by product (1Q13)



Source: KDB Daewoo Securities Research

Figure 84. Revenue breakdown by customer



Source: KDB Daewoo Securities Research

2. Investment points

We believe that OGS and metal mesh technologies can resolve problems arising from the high resistance of ITO in large-sized touchscreens (for notebooks and PCs). ELK is getting ready to mass produce both G2 (OGS) and metal mesh touchscreens, possibly starting in 3Q.

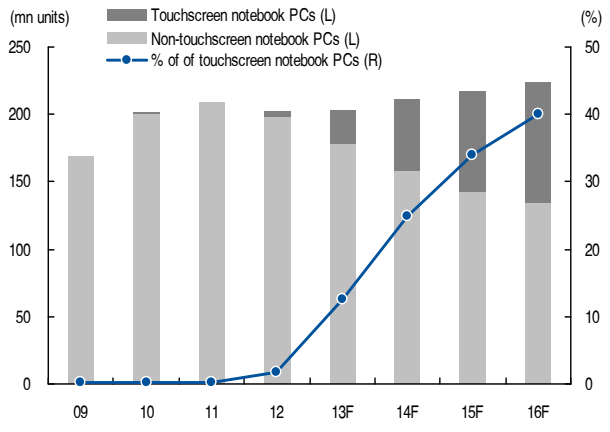
In 1Q13, PC sales volume shrank 14% YoY to 73mn units. With consumers turning to smartphones and tablet PCs, sales of conventional notebook and desktop computers are stagnating. Even the 4Q12 launch of Windows 8 did not revive their sales (the OS was designed to work not just on mobile devices but also on conventional computers). This is partly because only a few conventional computers support the interface (Metro UI) of Windows 8. We think that PC OEMs are likely to adopt the touchscreen display in order to protect their market share against tablet PCs and better utilize the interface of Windows 8.

As of end-2012, only 2% and 3% of laptop and desktop computers adopted touchscreens. Given the expected launch of 3rd generation Ultrabook models, as well as the emergence of hybrid PCs and all-in-one PCs, the proportion of PCs featuring touchscreens is likely to soar. We project 13% of notebooks (25mn units) and 14% of desktop computers (20mn units) to adopt touchscreens this year. And the touchscreen market is anticipated to grow at a CAGR of 104% by 2016, as 40% of notebook computers (or 89mn units) and 39% of desktop computers (or 56mn units) are expected to feature touchscreens in 2016.

On a negative note, touchscreen adoption is costly. A touchscreen for use in a 13-inch laptop computer costs around US$50. Currently, production of a laptop computer costs US$300-700. Assuming that a touchscreen is adopted in a high-end model (with a production cost of more than US$500), this adoption could increase overall costs by roughly 10%.

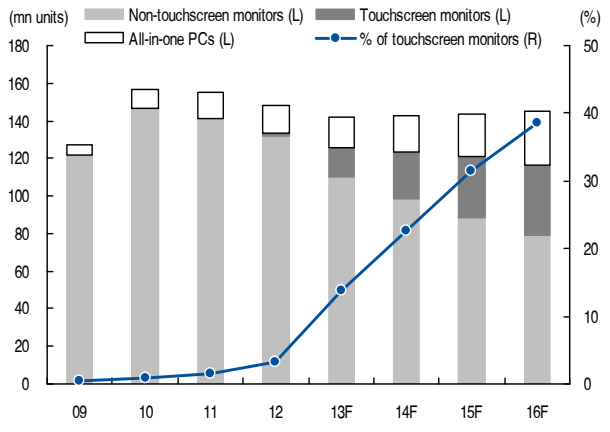
ELK supplies to global PC makers including SEC and HP. As such, we believe that the company stands to benefit greatly from rising demand for notebook- and PC-use touch panels. We expect notebook-use touchscreen revenue to surge from W14bn this year to W55.6bn 2014 and to W87.2bn in 2015.

Figure 85. Touchscreen panel penetration in notebook PCs



Source: KDB Daewoo Securities Research

Figure 86. Touchscreen panel penetration in desktop PCs



Source: KDB Daewoo Securities Research

3. Earnings forecast: Earnings to pick up full swing starting in 3Q

In 2013, we expect ELK to post consolidated revenue of W388.2bn (+113% YoY) and operating profit of W15.5bn (+273% YoY). The company's profitability deteriorated in 1Q, due to the low production yields of some products. Earnings recovery is estimated to be slow through 2Q, but momentum should pick up strongly beginning in 3Q, driven by mass production of G2-type (for large-sized screens) and metal mesh-type touch panels (which should start in the quarter).

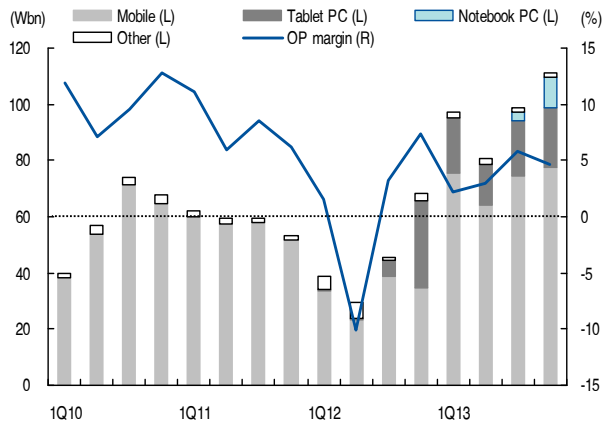
We expect limited earnings recovery in 2Q: revenue of W80.6bn (-17% QoQ, +174% YoY), and an operating profit of W2.4bn (+13%QoQ; swinging to profit YoY). SEC diversified its sources of touch panel supply for the Galaxy Grand in 2Q, which should dent ELK's revenue growth. Meanwhile, sales to HP and Sony are expanding steadily, brightening the company's outlook for 2H.

Table 22. Quarterly and annual earnings (under consolidated K-IFRS) (Wbn, %, %p)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Revenue	97.2	80.6	99.0	111.4	105.9	108.3	120.4	128.7	388.2	463.3	506.3
Smartphone	75.5	64.0	74.5	77.5	76.9	74.2	84.1	87.4	291.5	322.5	334.7
Tablet PC	19.4	14.5	19.4	21.6	14.3	18.5	20.8	25.8	74.9	79.4	80.1
Notebook PC			3.2	10.8	13.1	14.2	14.2	14.2	14.0	55.6	87.2
Other	2.3	2.0	1.8	1.6	1.6	1.5	1.4	1.3	7.8	5.8	4.4
Proportion of revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Smartphone	77.7	79.5	75.2	69.5	72.7	68.5	69.8	67.9	75.1	69.6	66.1
Tablet PC	20.0	18.0	19.6	19.4	13.5	17.1	17.3	20.1	19.3	17.1	15.8
Notebook PC			3.3	9.6	12.4	13.1	11.8	11.0	3.6	12.0	17.2
Other	2.3	2.5	1.8	1.5	1.5	1.4	1.2	1.0	2.0	1.3	0.9
Operating profit	2.1	2.4	5.7	5.2	6.8	7.4	8.8	10.0	15.5	33.0	39.7
OP margin	2.2	3.0	5.8	4.7	6.5	6.9	7.3	7.7	4.0	7.1	7.8
Net profit	1.8	1.7	4.6	4.2	5.6	6.2	7.4	8.5	12.2	27.8	32.6
Net margin	1.8	2.1	4.7	3.8	5.3	5.8	6.2	6.6	3.2	6.0	6.4
Growth (QoQ/YoY)											
Revenue	42.2	-17.1	22.8	12.6	-5.0	2.2	11.2	6.8	113.2	19.4	9.3
Smartphone	117.1	-15.2	16.3	4.0	-0.7	-3.6	13.3	3.9	123.2	10.6	3.8
Tablet PC	-37.5	-25.4	34.0	11.0	-33.6	29.0	12.7	24.0	98.4	6.0	0.8
Note PC				231.8	21.7	8.3	0.0	0.0		297.4	56.9
Other	-10.0	-10.0	-10.0	-10.0	-5.0	-5.0	-5.0	-5.0	-43.3	-25.3	-24.9
Operating profit	-57.1	13.3	135.4	-8.3	30.4	8.6	17.8	13.9	272.8	112.3	20.3
Net profit	-65.7	-5.7	178.7	-8.4	33.9	10.5	18.9	14.6	613.3	127.5	17.0

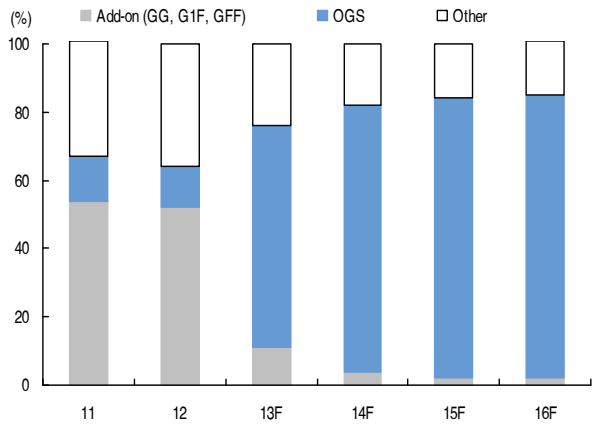
Source: Company data, KDB Daewoo Securities Research

Figure 87. Quarterly earnings



Source: Company data, KDB Daewoo Securities Research

Figure 88. Touchscreen panel technology for notebook PCs



Source: DisplaySearch

ELK (094190 KQ/TP: W22,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**184**	**388**	**463**	**506**
Cost of Sales	**169**	**331**	**381**	**413**
Gross Profit	**15**	**57**	**82**	**94**
SG&A Expenses	**21**	**42**	**49**	**54**
Operating Profit (Adj)	**-6**	**16**	**33**	**40**
Operating Profit	**-6**	**16**	**33**	**40**
Non-Operating Profit	**-4**	**-1**	**1**	**1**
Net Financial Income	6	0	0	0
Net Gain from Inv in Associates	0	0	0	0
Pretax Profit	-11	15	34	41
Income Tax	-3	3	6	8
Profit from Continuing Operations	**-7**	**12**	**28**	**33**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**-7**	**12**	**28**	**33**
Controlling Interests	-7	12	28	33
Non-Controlling Interests	0	0	0	0
Total Comprehensive Profit	**-7**	**12**	**28**	**33**
Controlling Interests	-7	12	28	33
Non-Controlling Interests	0	0	0	0
EBITDA	7	32	52	60
FCF (Free Cash Flow)	-67	-16	-6	7
EBITDA Margin (%)	3.9	8.2	11.1	11.8
Operating Profit Margin (%)	-3.3	4.0	7.1	7.8
Net Profit Margin (%)	-4.0	3.2	6.0	6.4

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**170**	**241**	**277**	**308**
Cash and Cash Equivalents	11	13	13	20
AR & Other Receivables	62	94	108	118
Inventories	84	117	135	148
Other Current Assets	13	17	20	21
Non-Current Assets	**144**	**148**	**160**	**171**
Investments in Associates	2	2	2	2
Property, Plant and Equipment	131	137	148	158
Intangible Assets	5	5	5	5
Total Assets	**314**	**389**	**437**	**479**
Current Liabilities	**178**	**222**	**236**	**246**
AP & Other Payables	43	91	105	114
Short-Term Financial Liabilities	132	132	132	132
Other Current Liabilities	3	0	0	0
Non-Current Liabilities	**43**	**50**	**57**	**59**
Long-Term Financial Liabilities	**43**	**48**	**56**	**58**
Other Non-Current Liabilities	1	1	1	1
Total Liabilities	**221**	**272**	**293**	**305**
Controlling Interests	**93**	**117**	**144**	**174**
Capital Stock	**7**	**7**	**7**	**7**
Capital Surplus	70	70	70	70
Retained Earnings	27	39	66	96
Non-Controlling Interests	**0**	**0**	**0**	**0**
Stockholders' Equity	**93**	**117**	**144**	**174**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**-11**	**6**	**24**	**37**
Net Profit	-7	12	28	33
Non-Cash Income and Expense	20	19	24	27
Depreciation	11	16	19	20
Amortization	2	0	0	0
Others	1	1	2	2
Chg in Working Capital	-22	-23	-21	-15
Chg in AR & Other Receivables	-14	-32	-15	-10
Chg in Inventories	-19	-34	-18	-13
Chg in AP & Other Payables	19	47	14	10
Income Tax Paid	-1	-3	-6	-8
Cash Flows from Inv Activities	**-55**	**-22**	**-30**	**-30**
Chg in PP&E	-53	-22	-30	-30
Chg in Intangible Assets	-1	0	0	0
Chg in Financial Assets	1	0	0	0
Others	-3	0	0	0
Cash Flows from Fin Activities	**40**	**18**	**6**	**-1**
Chg in Financial Liabilities	42	0	0	0
Chg in Equity	2	12	0	0
Dividends Paid	-1	0	-1	-2
Others	-2	0	0	0
Increase (Decrease) in Cash	**-26**	**2**	**1**	**6**
Beginning Balance	37	11	13	13
Ending Balance	11	13	13	20

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	-	13.3	5.9	5.0
P/CF (x)	46.6	5.8	3.5	3.1
P/B (x)	2.8	1.5	1.2	1.0
EV/EBITDA (x)	61.3	10.4	6.5	5.6
EPS (W)	-542	874	1,987	2,326
CFPS (W)	429	2,026	3,312	3,754
BPS (W)	7,168	7,965	9,845	12,011
DPS (W)	0	100	150	200
Payout ratio (%)	0.0	11.5	7.6	8.6
Dividend Yield (%)	0.0	0.9	1.3	1.7
Revenue Growth (%)	-22.1	111.1	19.4	9.3
EBITDA Growth (%)	-74.4	339.5	62.8	15.8
Operating Profit Growth (%)	TTR	TTB	112.3	20.3
EPS Growth (%)	TTR	TTB	127.3	17.0
Accounts Receivable Turnover (x)	3.3	5.0	4.6	4.5
Inventory Turnover (x)	2.4	3.9	3.7	3.6
Accounts Payable Turnover (x)	7.3	7.3	5.6	5.4
ROA (%)	-2.6	3.5	6.7	7.1
ROE (%)	-7.8	11.7	21.3	20.5
ROIC (%)	-2.7	4.8	9.2	9.8
Liability to Equity Ratio (%)	237.7	232.0	204.1	174.9
Current Ratio (%)	95.5	108.4	117.2	125.1
Net Debt to Equity Ratio (%)	175.4	142.4	121.2	97.3
Interest Coverage Ratio (x)	-0.9			

Source: Company data, KDB Daewoo Securities Research estimates

Melfas (096640 KQ)

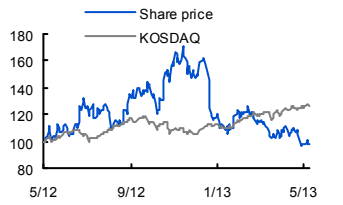
Overcoming growing pains

Display

(Initiate)	Buy
Target Price (12M, W)	25,000
Share Price (05/31/13, W)	16,700
Expected Return	50%

OP (13F, Wbn)	18
Consensus OP (13F, Wbn)	74
EPS Growth (13F, %)	-19.9
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	21.9
Market P/E (13F, x)	9.6
KOSDAQ	577.87
Market Cap (Wbn)	300
Shares Outstanding (mn)	18
Free Float (%)	78.1
Foreign Ownership (%)	11.9
Beta (12M)	0.80
52-Week Low (W)	16,250
52-Week High (W)	29,250

(%)	1M	6M	12M
Absolute	-9.5	-37.2	-11.4
Relative	-11.4	-40.8	-20.0



2H outlook: Focus to shift to bottom-line growth

Melfas shares have slumped 38% YTD due to: 1) the company's failure to supply controller ICs for the Galaxy S4 and 2) margin compression from the increasing proportion of G1F touchscreen panel modules in product mix. We believe that all of the known negatives are now priced in. The first half of the year was marked by top-line growth driven by increasing touchscreen panel module shipments. The second half will likely see improvements in bottom line driven by the launch of new models based on G1F and increasing demand for large-sized touchscreens.

Catalysts: 1) Laptop touchscreens and 2) possible supply for Galaxy Note 3

The performance of a touchscreen controller IC is determined by: 1) the number of sensor channels (i.e., electrodes connectable to the touchscreen) it has and 2) SNR. Controller ICs with more channels make larger and more responsive touchscreens possible. Because large touchscreens require either more chips or controller ICs with a higher number of sensor channels, they have the effect of driving ASP. As demand grows for large touchscreens (for ntoebooks, PC monitors, etc.), we expect the controller IC market to expand at a 31% CAGR to US$7.7bn by 2016.

A high SNR means signals are more effectively recognized and thus indicates stronger performance. Both the glove-friendly function and the hovering sensor capabilities featured in the Galaxy S4 require chips with high SNR. The key to detecting fingers hovering over a screen lies in a technology that allows for improved recognition of signals and the removal of noise. We believe the reason Melfas' controllers were not selected for the Galaxy S4 was because they did not have this near-touch sensing technology. The Galaxy Note 3, on the other hand, features a stylus pen and therefore does not need near-touch technology. We thus think Melfas could supply controller ICs for use in the Galaxy Note 3.

Valuation: Initiate Coverage with Buy and TP of W25,000

We initiate our coverage on Melfas with a Buy recommendation and a target price of W25,000. We believe the stock's pullback, which was triggered by a 1Q earnings shock, was excessive. From 2Q, we expect new G1F-based models and shipment growth of large touchscreens to push up the number of channels in controller ICs as well as ASP. On a consolidated basis, we forecast the company to post revenue of W155.3bn (-2.6% QoQ, +112% YoY) and swing to an operating profit of W4.2bn in 2Q. Our target price was derived by applying a P/E of 20x (the average multiple of global peers) to our 12 month-forward EPS estimate of W1,225. We expect earnings growth to gain meaningful momentum from 3Q.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	252	256	383	664	689	740
OP (Wbn)	38	16	24	18	42	58
OP Margin (%)	15.0	6.2	6.2	2.7	6.1	7.8
NP (Wbn)	36	15	14	11	33	43
EPS (W)	2,103	877	788	631	1,817	2,386
ROE (%)	31.2	10.9	9.2	6.9	17.6	19.5
P/E (x)	13.8	29.0	34.3	21.9	7.6	5.8
P/B (x)	3.7	3.0	2.9	1.4	1.2	1.0

Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

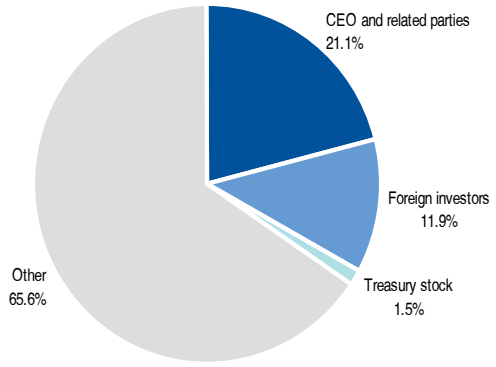
Company overview

Melfas is the only domestic company that manufactures touchscreen controller ICs and modules and utilizes glass sensor patterning (direct-patterned window (DPW)). The touchscreen controller IC market is led by foreign makers such as Atmel, Synaptics and Cypress. Domestic rivals include Zinitix and Imagis.

Up until 2011, revenue had hovered at around W200bn, driven mainly by touchscreen modules. However, after the company began supplying controller ICs to SEC's flagship smartphone models last year, revenue jumped 50% YoY to W383.3bn. Despite the solid revenue growth from controller ICs, fiercer competition in the touchsreen module segment has eaten into the company's profits. In particular, after the company's plan to supply controller ICs for the Galaxy S4 fell through, the stock plunged 38% YTD. However, we believe all of the known negatives are now priced in.

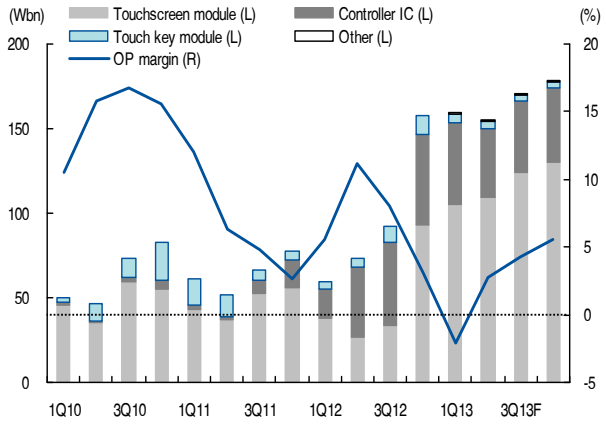
For 2013, we project revenue to rise sharply to W663.9bn (+73% YoY). However, the deterioration in margins suggests full-year operating profit will likely register a decline. The biggest drag on margins has been the increasing proportion of G1F-based touchscreen modules in product mix. The G1F solution still remains a low-margin technology because it requires both glass sensors and film sensors and has poor yields. Still, we believe the company will become increasingly more competitive, as: 1) glass sensors gain increasing importance and 2) better yields and new model releases boost margins.

Figure 89. Ownership structure (1Q13)



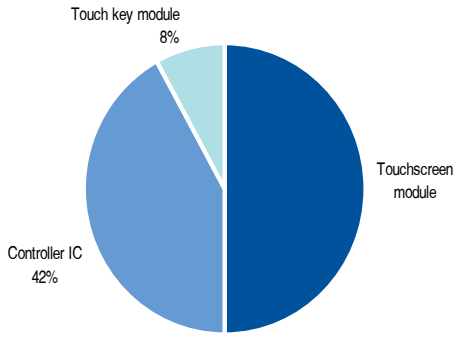
Source: Bloomberg

Figure 90. Annual revenue trend and forecasts



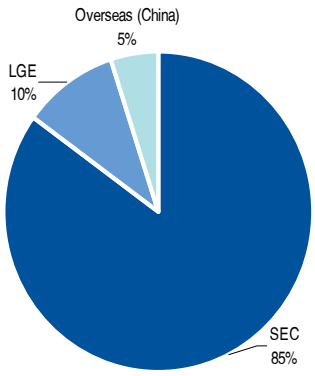
Source: Company data, KDB Daewoo Securities Research

Figure 91. Revenue breakdown by product (2012)



Source: KDB Daewoo Securities Research

Figure 92. Revenue breakdown by customer



Source: KDB Daewoo Securities Research

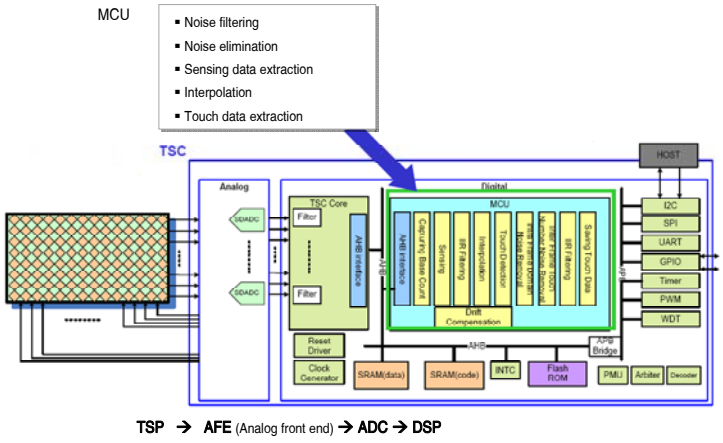
Investment points: 1) Supply for Galaxy Note 3 and 2) touch laptops

The performance of a touchscreen controller IC is determined by: 1) the number of sensor channels (i.e., electrodes connectable to the touchscreen) it has and 2) SNR. Controller ICs with more channels make larger and more responsive touchscreens possible. Because large touchscreens require either more chips or controller ICs with a higher number of sensor channels, they have the effect of driving ASP.

A high SNR means signals are more effectively recognized and thus indicates stronger performance. Both the glove-friendly function and the hovering sensor capabilities featured in the Galaxy S4 require chips with high SNR. The key to detecting fingers hovering over a screen lies in a technology that allows for improved recognition of signals and the removal of noise. We believe the reason Melfas' controllers were not selected for the Galaxy S4 was because they did not have this near-touch sensing technology. The Galaxy Note 3, on the other hand, features a stylus and therefore does not need near-touch technology. We thus think Melfas could supply controller ICs for the Galaxy Note 3.

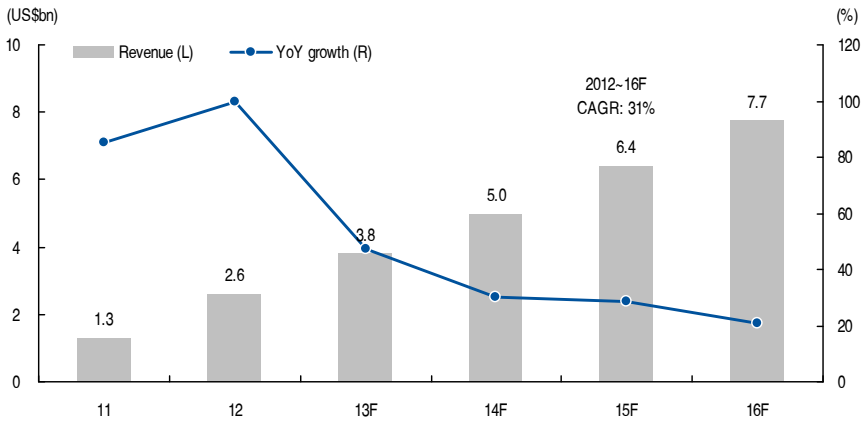
In 2013, the global controller IC market is estimated to reach US$3.8bn (+47% YoY). As demand grows for large touchscreens (laptops, PC monitors, etc.), we expect the market to expand at a 31% CAGR to US$7.7bn by 2016.

Figure 93. Structure of touchscreen panel controller IC



Source: Postech

Figure 94. Touchscreeen panel controller IC market



Source: DisplaySearch

Earnings outlook: Margins to gradually pick up after bottoming in 1Q

For the full year, we forecast revenue at W663.9bn (+73% YoY) and operating profit at W18.2bn (-34% YoY) under consolidated K-IFRS. Margins are likely to contract YoY given the rising proportion of G1F-based touchscreen panel modules. We believe 1H will be characterized by solid top-line growth (driven by stronger touchscreen panel module shipments) and 2H by improved margins.

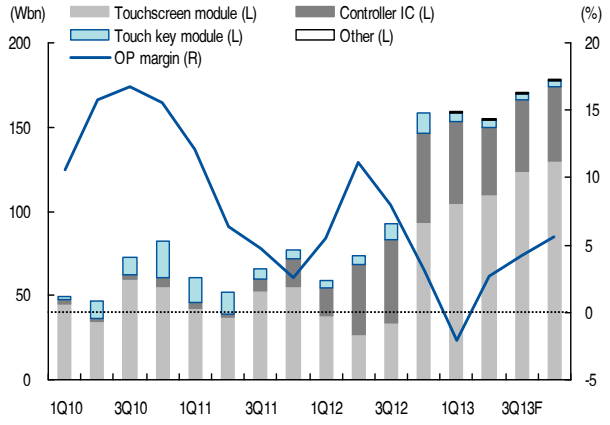
In 2Q, we expect revenue to shrink due to weaker shipments of controller ICs for the Galaxy S3 and Galaxy Note 2, but project better margins on improved G1F yields and the launch of new products by customers. For 2Q, we forecast the company to post consolidated revenue of W155.3bn (-3% QoQ, +112% YoY) and swing to an operating profit of W4.2bn.

Table 23. Quarterly and annual earnings (under consolidated K-IFRS) (Wbn, %, %p)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Revenue	159.5	155.3	170.6	178.4	162.6	163.3	177.0	186.4	663.9	689.2	740.2
Touchscreen module	105.0	109.8	123.7	130.0	115.2	116.6	126.3	132.8	468.6	490.9	518.5
Controller IC	48.2	40.3	42.4	44.4	43.0	42.5	46.6	49.6	175.4	181.7	205.6
Touch key module	5.3	4.2	3.5	3.0	2.9	2.7	2.6	2.4	16.0	10.6	5.2
Others	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	3.9	6.0	10.9
Proportion of revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Touchscreen module	65.8	70.7	72.5	72.9	70.8	71.4	71.4	71.3	70.6	71.2	70.0
Controller IC	30.2	26.0	24.9	24.9	26.5	26.0	26.3	26.6	26.4	26.4	27.8
Touch key module	3.3	2.7	2.0	1.7	1.8	1.7	1.4	1.3	2.4	1.5	0.7
Operating profit	-3.3	4.2	7.2	10.0	8.0	9.5	12.1	12.7	18.2	42.2	57.6
OP margin	-2.0	2.7	4.2	5.6	4.9	5.8	6.8	6.8	2.7	6.1	7.8
Net profit	-3.8	2.3	5.6	7.2	6.1	6.9	10.0	9.6	11.3	32.7	42.9
Net margin	-2.4	1.5	3.3	4.1	3.8	4.2	5.6	5.2	1.7	4.7	5.8
Growth (QoQ/YoY)											
Revenue	0.9	-2.6	9.8	4.6	-8.9	0.5	8.3	5.3	73.2	3.8	7.4
Touchscreen module	12.3	4.5	12.7	5.1	-11.4	1.2	8.4	5.1	144.6	4.8	5.6
Controller IC	-9.0	-16.4	5.2	4.6	-3.1	-1.1	9.5	6.6	9.0	3.6	13.2
Touch key module	-54.3	-20.6	-18.2	-12.2	-4.6	-6.0	-5.9	-6.0	-48.0	-34.0	-51.2
Operating profit	TTR	TTB	70.2	38.7	-19.8	18.5	27.5	4.6	-34.4	132.7	36.3
Net profit	TTR	TTB	140.0	28.8	-15.4	13.5	43.9	-3.5	-43.7	187.9	31.3

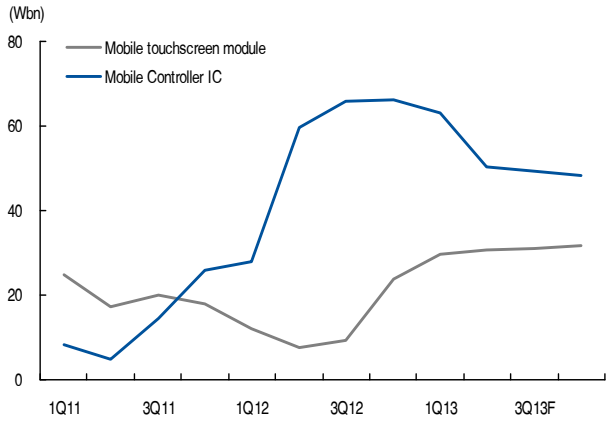
Note: "TTR" and "TTB" refer to "turning to red" and "turning to black", respectively.
Source: Company data, KDB Daewoo Securities Research

Figure 95. Quarterly earnings



Source: Company data, KDB Daewoo Securities Research

Figure 96. Touchscreen module and controller IC M/S within SEC



Source: KDB Daewoo Securities Research

Melfas (096640 KQ/TP: W25,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**383**	**664**	**689**	**740**
Cost of Sales	**332**	**608**	**608**	**640**
Gross Profit	**52**	**56**	**82**	**101**
SG&A Expenses	**28**	**38**	**39**	**43**
Operating Profit (Adj)	**24**	**18**	**42**	**58**
Operating Profit	**24**	**18**	**42**	**58**
Non-Operating Profit	**-9**	**-4**	**-4**	**-4**
Net Financial Income	2	0	0	0
Net Gain from Inv in Associates	-1	0	0	0
Pretax Profit	15	14	38	54
Income Tax	1	3	6	11
Profit from Continuing Operations	**14**	**11**	**33**	**43**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**14**	**11**	**33**	**43**
Controlling Interests	14	11	33	43
Non-Controlling Interests	0	0	0	0
Total Comprehensive Profit	**13**	**11**	**33**	**43**
Controlling Interests	13	11	33	43
Non-Controlling Interests	0	0	0	0
EBITDA	35	34	60	76
FCF (Free Cash Flow)	-24	-16	29	26
EBITDA Margin (%)	9.2	5.1	8.7	10.3
Operating Profit Margin (%)	6.2	2.7	6.1	7.8
Net Profit Margin (%)	3.6	1.7	4.7	5.8

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**207**	**256**	**293**	**335**
Cash and Cash Equivalents	36	19	47	70
AR & Other Receivables	72	103	107	115
Inventories	86	118	123	132
Other Current Assets	8	11	11	12
Non-Current Assets	**131**	**121**	**124**	**135**
Investments in Associates	6	6	6	6
Property, Plant and Equipment	110	109	112	123
Intangible Assets	1	1	1	1
Total Assets	**338**	**377**	**417**	**470**
Current Liabilities	**177**	**203**	**208**	**218**
AP & Other Payables	96	111	116	125
Short-Term Financial Liabilities	77	77	77	77
Other Current Liabilities	4	14	15	16
Non-Current Liabilities	**0**	**4**	**8**	**12**
Long-Term Financial Liabilities	**0**	**0**	**0**	**0**
Other Non-Current Liabilities	0	4	8	12
Total Liabilities	**178**	**207**	**216**	**230**
Controlling Interests	**160**	**170**	**201**	**240**
Capital Stock	**9**	**9**	**9**	**9**
Capital Surplus	66	66	66	66
Retained Earnings	90	100	131	170
Non-Controlling Interests	**0**	**0**	**0**	**0**
Stockholders' Equity	**160**	**170**	**201**	**240**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**1**	**0**	**49**	**57**
Net Profit	14	11	33	43
Non-Cash Income and Expense	22	22	27	33
Depreciation	11	15	18	18
Amortization	0	0	0	0
Others	-8	-3	-2	-3
Chg in Working Capital	-34	-31	-5	-8
Chg in AR & Other Receivables	-42	-31	-5	-8
Chg in Inventories	-45	-32	-5	-9
Chg in AP & Other Payables	57	15	5	9
Income Tax Paid	0	-3	-6	-11
Cash Flows from Inv Activities	**-29**	**-15**	**-20**	**-30**
Chg in PP&E	-27	-15	-20	-30
Chg in Intangible Assets	0	0	0	0
Chg in Financial Assets	-2	0	0	0
Others	0	0	0	0
Cash Flows from Fin Activities	**56**	**-2**	**-2**	**-4**
Chg in Financial Liabilities	52	0	0	0
Chg in Equity	7	0	0	0
Dividends Paid	-2	-2	-2	-4
Others	-2	0	0	0
Increase (Decrease) in Cash	**28**	**-17**	**28**	**24**
Beginning Balance	8	36	19	47
Ending Balance	36	19	47	70

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	34.3	21.9	7.6	5.8
P/CF (x)	18.9	9.3	5.0	4.1
P/B (x)	2.9	1.4	1.2	1.0
EV/EBITDA (x)	14.8	9.0	4.6	3.3
EPS (W)	788	631	1,817	2,386
CFPS (W)	1,429	1,488	2,791	3,409
BPS (W)	9,230	9,697	11,415	13,603
DPS (W)	100	100	200	300
Payout ratio (%)	12.7	15.6	10.9	12.4
Dividend Yield (%)	0.4	0.7	1.4	2.2
Revenue Growth (%)	49.6	73.2	3.8	7.4
EBITDA Growth (%)	53.1	-4.6	78.1	27.1
Operating Profit Growth (%)	50.7	-23.9	132.7	36.3
EPS Growth (%)	-10.2	-19.9	187.9	31.3
Accounts Receivable Turnover (x)	8.2	8.8	7.6	7.7
Inventory Turnover (x)	6.0	6.5	5.7	5.8
Accounts Payable Turnover (x)	6.4	7.6	7.6	7.7
ROA (%)	5.1	3.2	8.2	9.7
ROE (%)	9.2	6.9	17.6	19.5
ROIC (%)	13.8	7.4	16.4	19.8
Liability to Equity Ratio (%)	110.9	122.0	107.9	95.9
Current Ratio (%)	116.6	126.0	140.8	153.5
Net Debt to Equity Ratio (%)	22.6	31.2	12.7	0.8
Interest Coverage Ratio (x)	13.4			

Source: Company data, KDB Daewoo Securities Research estimates

LG Display (034220 KS)

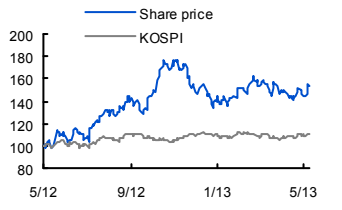
Still cloudy

Display

(Maintain)	Trading Buy
Target Price (12M, W)	34,000
Share Price (05/31/13, W)	31,450
Expected Return	8%

OP (13F, Wbn)	1,109
Consensus OP (13F, Wbn)	1,381
EPS Growth (13F, %)	260.5
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	13.1
Market P/E (13F, x)	9.6
KOSPI	2,001.05
Market Cap (Wbn)	11,253
Shares Outstanding (mn)	358
Free Float (%)	62.1
Foreign Ownership (%)	30.1
Beta (12M)	1.27
52-Week Low (W)	19,600
52-Week High (W)	36,950

(%)	1M	6M	12M
Absolute	5.0	-9.1	50.5
Relative	3.1	-12.6	41.9



2H outlook: Chinese subsidy programs to end

TV demand is still sluggish. 1Q global TV sales volume shrank 3% YoY. 1Q LCD TV sales volume was solid (+4% YoY to 44.8mn units) as a whole, but sales volume in ex-China markets was tepid. Indeed, combined sales volume in North America, Europe, and Japan contracted 8% YoY to 18.94mn units, while Chinese sales volume expanded 28% YoY to 12.5mn units.

Traditionally, LCD TV sales tend to be robust in the second half of the year, aided by strong seasonality in developed economies (e.g., Black Friday and the Christmas holidays). However, we do not expect to see a seasonal boost this year in light of tepid sales in developed countries and an increased proportion of Chinese sales (out of overall sales). This year, we believe that the scheduled end of energy subsidies in China will dampen 2H demand.

Influential factors: New Apple products, end of China's subsidy program

Apple is scheduled to host its weeklong Worldwide Developers Conference (WWDC) 2013 starting on June 10th. We do not expect to see any new hardware come in. Instead, we expect the company to introduce new operating systems (i.e., iOS 7, OSX 10.9). These operating systems are likely to support Apple's new products (to come in 3Q). Apple products that are likely to be rolled out in 2H include the iPhone 5S, a low-end iPhone, the 5G iPad, and the iPad mini 2. Apple's new product releases should positively affect LG Display (LGD) starting in 3Q. However, these positive effects could be offset by competitors' increasing supply to Apple.

The Chinese government decided not to extend its energy subsidy program. In fact, strong LCD TV sales during the Labor Day holidays seem attributable to the fact that consumers rushed to buy TVs before the end of the program. We forecast Chinese LCD TV demand to slow in 2H. In Japan, the TV market shrank considerably after the end of a subsidy program in 2011. TV sales in Japan plummeted 59% YoY from 19mn units in 2011 to 7.9mn units in 2012.

Valuation: Maintain Trading Buy with TP of W34,000

We maintain our Trading Buy rating with a target price of W34,000. We project LGD's 2Q consolidated revenue and operating profit at W7.2tr (+6% QoQ, +4% YoY) and W319bn (+111% QoQ, +34% YoY), respectively. In the near term, LGD shares could rise on the back of earnings expectations and projected new product launches by Apple. Still, investors should keep in mind significant downside risks related to LCD TV demand contraction in 2H.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	25,512	24,291	29,430	30,236	31,104	31,597
OP (Wbn)	1,311	-764	912	1,109	959	1,264
OP Margin (%)	5.1	-3.1	3.1	3.7	3.1	4.0
NP (Wbn)	1,156	-771	233	841	771	993
EPS (W)	3,232	-2,155	652	2,350	2,154	2,775
ROE (%)	11.0	-7.3	2.3	7.9	6.9	8.4
P/E (x)	12.3	-	47.6	13.1	14.3	11.1
P/B (x)	1.4	0.9	1.1	1.1	1.0	0.9

Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

2Q preview: Revenue of W7.2tr (+4% YoY); OP of W319bn (+34% YoY)

We forecast LGD's 2Q shipment area to expand 9% QoQ. By product, TV panels are forecast to see the biggest shipment area increase (+14% QoQ). Meanwhile, mobile-use panel shipment area is estimated to decline 1% QoQ. The company's 2Q ASP is projected to decline 4% QoQ in light of an increased proportion of TV sales.

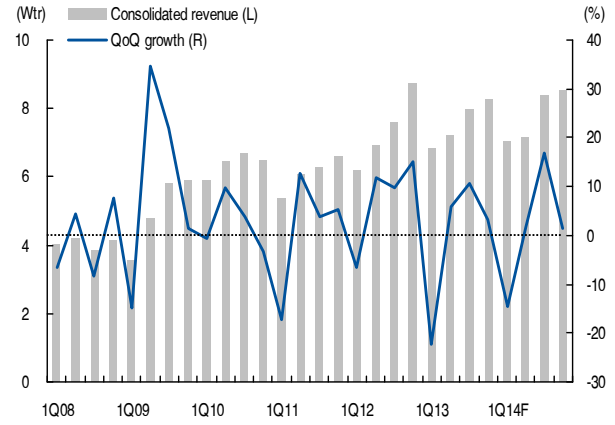
We project LGD's 3Q and 4Q operating profits to come in at W391bn and W247bn, respectively—conservative estimates compared to the consensus (W433bn and W464bn).

Table 24. Quarterly and annual earnings (under consolidated K-IFRS) (Wbn, %)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Avg. US$/W rate	1,084	1,095	1,070	1,065	1,065	1,065	1,065	1,065	1,079	1,065	1,065
Shipment area (km^2)	8,182	8,902	9,785	9,967	8,691	9,439	10,388	10,870	36,808	39,389	41,216
ASP (US$/$m^2$)	770	739	762	777	762	714	757	734	762	741	720
Revenue	6,803	7,207	7,979	8,248	7,049	7,177	8,380	8,497	30,236	31,104	31,597
Notebook PC	612	633	742	695	597	639	654	687	2,683	2,576	2,422
Monitor	1,429	1,448	1,511	1,424	1,302	1,306	1,271	1,354	5,813	5,234	5,196
TV	2,925	3,299	3,283	3,402	2,984	3,300	3,696	3,749	12,909	13,728	13,982
Small- to mid-sized panels	1,837	1,826	2,443	2,726	2,167	1,932	2,760	2,707	8,832	9,566	9,996
COGS	6,099	6,318	7,001	7,396	6,352	6,427	7,286	7,476	26,814	27,541	27,599
Raw material costs	4,500	4,846	5,492	5,902	4,812	4,834	5,666	5,928	20,740	21,240	21,225
Depreciation	1,118	989	1,024	1,007	1,050	1,100	1,125	1,050	4,138	4,325	4,347
SG&A	553	570	587	604	622	641	660	680	2,314	2,604	2,734
Operating profit	151	319	391	247	75	109	434	341	1,109	959	1,264
OP margin	2.2	4.4	4.9	3.0	1.1	1.5	5.2	4.0	3.7	3.1	4.0
EBITDA	1,269	1,308	1,415	1,254	1,125	1,209	1,559	1,391	5,247	5,284	5,610
EBITDA margin	18.7	18.2	17.7	15.2	16.0	16.8	18.6	16.4	17.4	17.0	17.8
Growth (QoQ/YoY)											
Shipment area	-18.7	8.8	9.9	1.9	-12.8	8.6	10.1	4.6	2.8	7.0	4.6
ASP	-4.0	-4.0	3.1	2.0	-2.0	-6.3	6.1	-3.1	4.3	-2.7	-2.9
Revenue	-22.2	5.9	10.7	3.4	-14.5	1.8	16.8	1.4	2.7	2.9	1.6
Notebook PC	-30.0	3.4	17.2	-6.3	-14.2	7.0	2.4	5.1	-28.6	-4.0	-6.0
Monitor	2.1	1.3	4.3	-5.8	-8.5	0.3	-2.7	6.6	14.2	-10.0	-0.7
TV	-22.2	12.8	-0.5	3.6	-12.3	10.6	12.0	1.4	-5.2	6.3	1.8
Small- to mid-sized panels	-32.2	-0.6	33.8	11.6	-20.5	-10.8	42.9	-1.9	26.8	8.3	4.5
COGS	-20.1	3.6	10.8	5.6	-14.1	1.2	13.4	2.6	1.5	2.7	0.2
Raw material costs	-24.1	7.7	13.3	7.5	-18.5	0.5	17.2	4.6	2.2	2.4	-0.1
Depreciation	-8.9	-11.5	3.5	-1.7	4.3	4.8	2.3	-6.7	-7.4	4.5	0.5
SG&A	6.6	3.0	3.0	3.0	3.0	3.0	3.0	3.0	10.5	12.6	5.0
Operating profit	-74.2	111.0	22.7	-36.8	-69.7	45.3	298.3	-21.5	21.6	-13.5	31.8
OP margin	-4.5	2.2	0.5	-1.9	-1.9	0.5	3.7	-1.2	0.6	-0.6	0.9
EBITDA	-30.0	3.1	8.2	-11.4	-10.3	7.5	29.0	-10.8	-2.5	0.7	6.2
EBITDA margin	-2.1	-0.5	-0.4	-2.5	0.8	0.9	1.8	-2.2	-0.9	-0.4	0.8

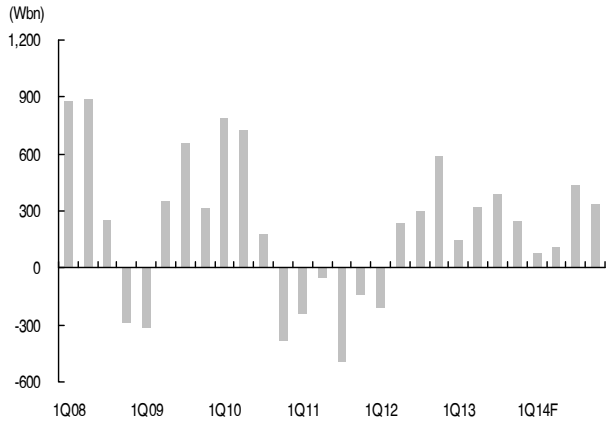
Source: Company data, KDB Daewoo Securities Research

Figure 97. Consolidated revenue



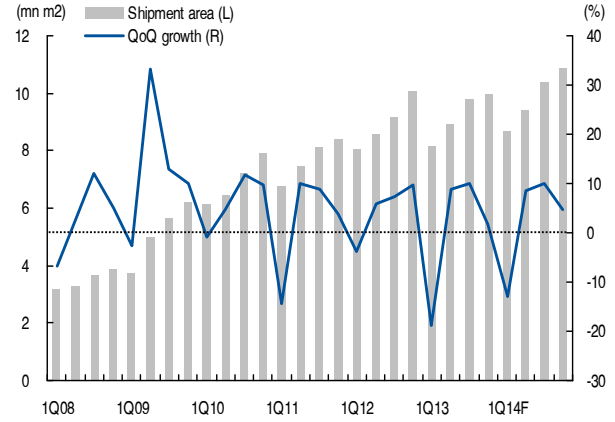
Source: Company data, KDB Daewoo Securities Research

Figure 98. Consolidated operating profit



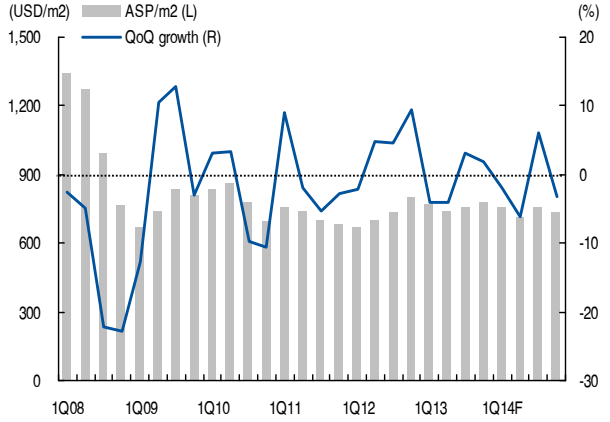
Source: Company data, KDB Daewoo Securities Research

Figure 99. LCD panel shipment area



Source: Company data, KDB Daewoo Securities Research

Figure 100. ASP trend



Source: Company data, KDB Daewoo Securities Research

LG Display (034220 KS/TP: W34,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**29,430**	**30,236**	**31,104**	**31,597**
Cost of Sales	**26,425**	**26,814**	**27,541**	**27,599**
Gross Profit	**3,005**	**3,423**	**3,563**	**3,998**
SG&A Expenses	**2,093**	**2,314**	**2,604**	**2,734**
Operating Profit (Adj)	**912**	**1,109**	**959**	**1,264**
Operating Profit	**912**	**1,109**	**959**	**1,264**
Non-Operating Profit	**-454**	**-71**	**-40**	**-80**
Net Financial Income	159	147	133	116
Net Gain from Inv in Associates	36	48	48	48
Pretax Profit	459	1,039	919	1,184
Income Tax	222	187	138	178
Profit from Continuing Operations	**236**	**852**	**781**	**1,006**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**236**	**852**	**781**	**1,006**
Controlling Interests	233	841	771	993
Non-Controlling Interests	3	11	10	13
Total Comprehensive Profit	**96**	**764**	**693**	**918**
Controlling Interests	94	750	681	903
Non-Controlling Interests	2	13	13	16
EBITDA	5,382	5,441	5,543	5,865
FCF (Free Cash Flow)	-431	511	1,214	1,461
EBITDA Margin (%)	18.3	18.0	17.8	18.6
Operating Profit Margin (%)	3.1	3.7	3.1	4.0
Net Profit Margin (%)	0.8	2.8	2.5	3.1

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**8,915**	**10,678**	**12,153**	**13,436**
Cash and Cash Equivalents	2,339	3,496	4,786	5,965
AR & Other Receivables	3,524	3,621	3,725	3,784
Inventories	2,390	2,456	2,526	2,566
Other Current Assets	347	356	366	372
Non-Current Assets	**15,541**	**14,676**	**14,398**	**14,100**
Investments in Associates	402	445	493	540
Property, Plant and Equipment	13,108	12,157	11,832	11,485
Intangible Assets	498	475	468	465
Total Assets	**24,456**	**25,354**	**26,551**	**27,536**
Current Liabilities	**9,206**	**8,667**	**8,892**	**9,020**
AP & Other Payables	6,958	6,571	6,760	6,867
Short-Term Financial Liabilities	1,015	830	830	830
Other Current Liabilities	1,233	1,267	1,303	1,324
Non-Current Liabilities	**5,009**	**5,631**	**6,089**	**6,207**
Long-Term Financial Liabilities	**3,441**	**3,896**	**3,896**	**3,896**
Other Non-Current Liabilities	1,388	1,507	1,917	2,035
Total Liabilities	**14,215**	**14,298**	**14,981**	**15,227**
Controlling Interests	**10,210**	**10,960**	**11,462**	**12,186**
Capital Stock	**1,789**	**1,789**	**1,789**	**1,789**
Capital Surplus	2,251	2,251	2,251	2,251
Retained Earnings	6,239	7,080	7,671	8,485
Non-Controlling Interests	**30**	**96**	**108**	**124**
Stockholders' Equity	**10,240**	**11,056**	**11,570**	**12,309**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**4,730**	**5,320**	**5,519**	**5,725**
Net Profit	236	852	781	1,006
Non-Cash Income and Expense	5,292	4,724	4,762	4,859
Depreciation	4,197	4,068	4,325	4,347
Amortization	273	264	259	255
Others	-805	-16	145	88
Chg in Working Capital	-721	-71	114	38
Chg in AR & Other Receivables	-1,457	-207	-104	-59
Chg in Inventories	-73	-66	-70	-40
Chg in AP & Other Payables	148	79	189	107
Income Tax Paid	-78	-185	-138	-178
Cash Flows from Inv Activities	**-3,655**	**-4,250**	**-4,196**	**-4,179**
Chg in PP&E	-3,914	-3,620	-4,000	-4,000
Chg in Intangible Assets	-286	-252	-252	-252
Chg in Financial Assets	509	-420	0	0
Others	36	42	56	73
Cash Flows from Fin Activities	**-241**	**24**	**-34**	**-368**
Chg in Financial Liabilities	-61	210	0	0
Chg in Equity	0	0	0	0
Dividends Paid	0	0	-179	-179
Others	-180	-186	145	-189
Increase (Decrease) in Cash	**821**	**1,158**	**1,290**	**1,178**
Beginning Balance	1,518	2,339	3,496	4,786
Ending Balance	2,339	3,496	4,786	5,965

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	47.6	13.1	14.3	11.1
P/CF (x)	2.4	2.1	2.1	2.0
P/B (x)	1.1	1.1	1.0	0.9
EV/EBITDA (x)	2.4	2.2	2.0	1.7
EPS (W)	652	2,350	2,154	2,775
CFPS (W)	13,143	14,457	14,965	15,634
BPS (W)	27,143	29,305	30,726	32,756
DPS (W)	0	500	500	500
Payout ratio (%)	0.0	21.3	23.2	18.0
Dividend Yield (%)	0.0	1.6	1.6	1.6
Revenue Growth (%)	21.2	2.7	2.9	1.6
EBITDA Growth (%)	86.4	1.1	1.9	5.8
Operating Profit Growth (%)	TTB	21.6	-13.5	31.8
EPS Growth (%)	TTB	260.5	-8.3	28.8
Accounts Receivable Turnover (x)	9.7	9.0	9.0	8.9
Inventory Turnover (x)	12.5	12.5	12.5	12.4
Accounts Payable Turnover (x)	7.4	7.2	7.2	7.2
ROA (%)	1.0	3.4	3.0	3.7
ROE (%)	2.3	7.9	6.9	8.4
ROIC (%)	4.4	7.9	8.1	11.1
Liability to Equity Ratio (%)	138.8	129.3	129.5	123.7
Current Ratio (%)	96.8	123.2	136.7	149.0
Net Debt to Equity Ratio (%)	17.6	4.3	-7.0	-16.2
Interest Coverage Ratio (x)	4.9	5.9	5.1	6.7

Source: Company data, KDB Daewoo Securities Research estimates

Iljin Display (020760 KS)

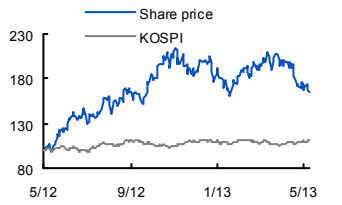
Building on strong tablet PC momentum

Display

(Initiate)	Trading Buy
Target Price (12M, W)	22,000
Share Price (05/31/13, W)	18,200
Expected Return	21%

OP (13F, Wbn)	63
Consensus OP (13F, Wbn)	89
EPS Growth (13F, %)	-12.4
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	8.5
Market P/E (13F, x)	9.6
KOSPI	2,001.05
Market Cap (Wbn)	515
Shares Outstanding (mn)	28
Free Float (%)	53.8
Foreign Ownership (%)	16.0
Beta (12M)	0.90
52-Week Low (W)	10,550
52-Week High (W)	24,150

(%)	1M	6M	12M
Absolute	-16.7	-16.3	55.6
Relative	-18.6	-19.9	47.0



2H outlook: New models and capacity ramp-ups to sustain top-line growth

In 2013, we expect Iljin Display to once again deliver record-high revenue of W718.5bn (+20.5% YoY) on the back of SEC's fast-growing tablet PC business. In particular, we look for strong top-line growth in 3Q, when new tablet models are set to be released and the company's new plant is scheduled to come online.

On the other hand, full-year operating profit is forecast to slide 2.6% YoY to W62.9bn, weighed down by a weak 1H due to: 1) the delayed release of new products, and 2) poor yields from a newly operational plant. Although we see higher margins in 2H than in 1H, intensifying competition should put downside pressures on ASP, making a return to double-digit margins unlikely. Also, with tax losses carried forward set to end this year, net profit is likely to contract despite buoyant top-line growth.

Catalysts: 1) SEC tablet-PC growth, 2) demand for narrow-bezel touch panels

2013 is expected to be a strong year for Android-powered tablet PCs, with SEC leading the charge. We forecast SEC to ship 35.5mn tablet PCs in 2013, up 131% YoY.

Iljin Display is positioned to benefit the most from SEC's growing tablet sales, as it supplies an estimated 40% of the touchscreens used in the electronic giant's tablet PCs. We expect Iljin Display's medium- to large-sized touchscreen shipments to jump 80% YoY to 16mn units in 2013. We see revenue rising 29% YoY to W508.2bn, despite the increasing proportion of 7-8" low-end tablets in product mix and an over 20% decline in ASP.

Since 2H12, the company has stepped up its spending on touchscreen lines using photolithography processes. As a result, monthly capacity should increase to 6mn units by end-2Q. The use of photolithography helps reduce line width, thereby making bezels thinner and improving visibility. With demand for tablet PCs with thin bezel sexpected to rise going forward, we believe the firm's early investments will position it to effectively respond to potential demand.

Valuation: Initiate with Trading Buy and TP of W22,000

We initiate our coverage on Iljin Display with a Trading Buy rating and a target price of W22,000. Despite strong revenue growth, we expect margin gains to be muted, held back by downside pricing pressures (amid stiffening competition) and the end of tax losses carried forward. We arrived at our target price by applying a P/E of 11x to our 12 month-forward EPS of W1,975.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	114	324	597	719	781	814
OP (Wbn)	15	36	65	63	66	68
OP Margin (%)	12.7	11.2	10.8	8.8	8.5	8.3
NP (Wbn)	12	31	64	58	52	54
EPS (W)	446	1,153	2,356	2,064	1,850	1,904
ROE (%)	25.3	43.2	53.3	32.9	23.0	19.6
P/E (x)	25.4	10.1	9.4	8.5	9.5	9.2
P/B (x)	8.7	4.6	4.5	2.7	2.1	1.8

Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

Company overview

Iljin Display is an IT components supplier that mass produces touchscreen modules and sapphire wafers used in LED. The company was formerly part of the wafer and ingot division of Iljin Diamond (established in April 1994) before being spun off in December 2004. The firm began producing wafers in 2005 and then expanded into the touchscreen business after acquiring the touchscreen supplier A-Touch in August 2008.

The company currently operates two manufacturing sites: one in Pyeongtaek (touchscreen modules) and another in Eumseong (sapphire wafers). As of end-March, the firm has a touchscreen module capacity of 14mn units per month (based on 3.5"), which is set to expand to W16mn units by the end of June following the completion of a second plant in May. The company's sapphire wafer capacity is around 600,000 units per month.

Sapphire wafers, which had been the firm's mainstay business until 2010, slipped into a downturn amid a supply glut stemming from downstream industries' overinvestment and slower-than-expected demand. As a result, Iljin's sapphire wafer revenue has been on a downtrend since 2010 and now makes up only 5.5% of overall revenue (as of 2012).

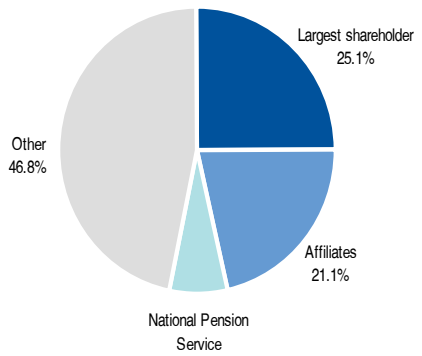
Touchscreen modules, which constituted 94.5% of 2012 revenue, became the firm's primary focus after it began shipping 7" touchscreens for use in Galaxy tablets in October 2010. Overthe past couple of years, touchscreen module revenue has increased at an astonishing CAGR of 350%. The company's shipments of smartphone touchscreens began to gain steam in April 2011, and 10.1" tablet PC touchscreens in the following June.

Table 25. Corporate history

Year	Month	Event
1994	April	Iljin Diamond was established.
2001		First Korean company to begin LT-wafer development
2002	January	IPO of Iljin Diamond
	August	Development of 2" sapphire wafer
2004	December	Iljin Display listed as a separate company
2006	October	Supply of sapphire wafers for LED
	December	Development of 4" sapphire wafer
2008	August	M&A for touchscreen panel company, A-Touch
2009	August	Registered as a supplier to Samsung Mobile Display
	November	Registered as a supplier to SEC
2010	October	Delivery of C-type 7" touchscreen panels for tablet PCs
2011	June	Delivery of C-type 10.1" touchscreen panels for tablet PCs
		Included in KOSPI 200

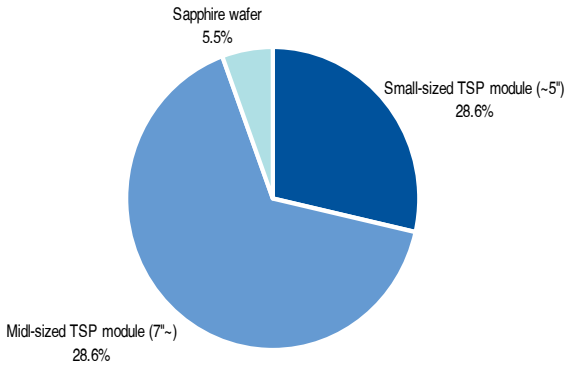
Source: Company data

Figure 101. Ownership structure (1Q13)



Source: Company data

Figure 102. Revenue breakdown by product (2012)



Source: Company data

Investment point: 1) SEC tablet PCs, 2) narrow-bezel touch-panel demand

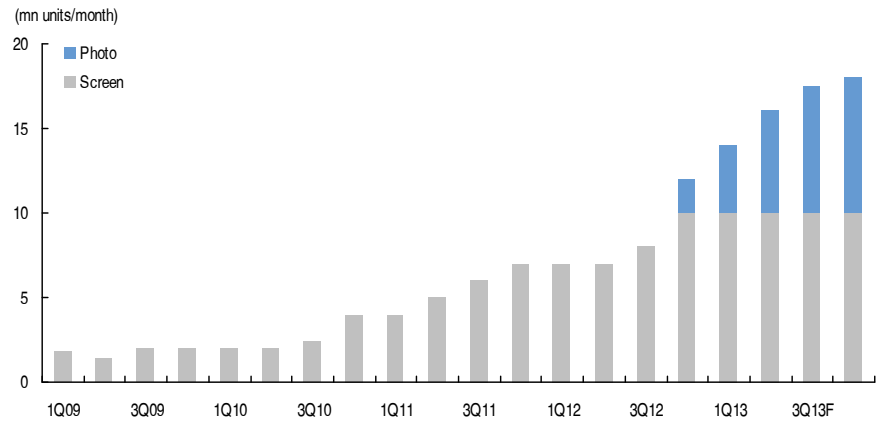
Although Apple's iPad controlled more than half (57%) of the global tablet PC market in 2012, we project market growth will be driven by Android-powered tablet PCs from 2013. In particular, we think SEC will be the strongest performer, with 2013 shipments forecast at 35.5mn units (+131% YoY).

Iljin Display is positioned to benefit the most from SEC's growing tablet sales, as it supplies an estimated 40% of the touchscreens used in the electronic giant's tablet PCs. We expect Iljin Display's medium- to large-sized touchscreen shipments to jump 80% YoY to 16mn units in 2013. We see revenue rising 29% YoY to W508.2bn, despite the increasing product mix of 7-8" low-end tablets and an over 20% annual decline in ASP.

Since 2H12, the company has stepped up investments in building touchscreen lines that use photo processes. With the construction of a second plant finished in May, monthly capacity of photo-based touchscreens should increase to 6mn units by end-2Q.

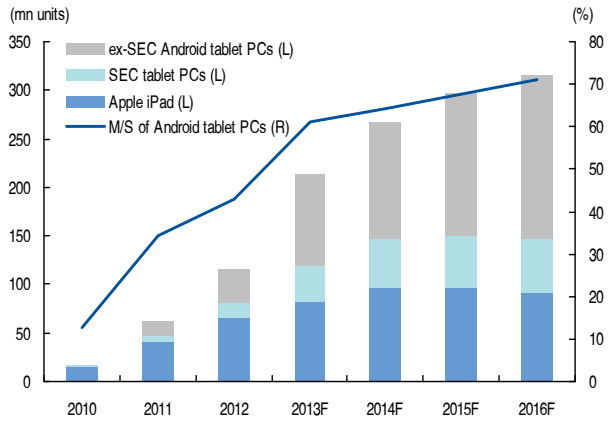
The use of photolithography helps reduce line width, thereby making bezels thinner and improving visibility. With demand for tablet PCs with narrow bezels expected to rise going forward, we believe the firm's early investments will position it to effectively respond to potential demand.

Figure 103. Capacity trends and forecasts



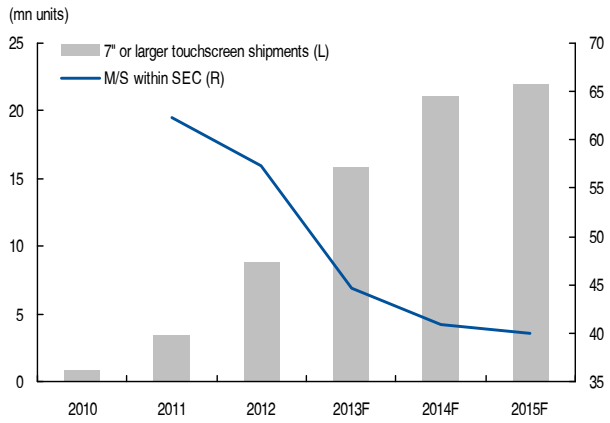
Source: Company data, KDB Daewoo Securities Research

Figure 104. Global tablet PC shipments



Source: IDC, KDB Daewoo Securities Research

Figure 105. Iljin Display's large-sized touchscreen panel shipments and market share within SEC



Source: Company data, KDB Daewoo Securities Research

2013F: Revenue of W718.5bn (+21% YoY), OP of W62.9bn (-3% YoY)

For 2013, we expect Iljin Display to once again deliver record-high revenue of W718.5bn (+20.5% YoY) on the back of SEC's fast-growing tablet PC businesses. 2Q revenue is forecast to be a disappointing W157.9bn, as medium- to large-sized touchscreen revenue is estimated to contract 15% QoQ amid the absence of new tablet models. However, we see strong top-line growth from medium- to large-sized touchscreens in 3Q, when new tablet lineups are set to be released.

On the other hand, 2013 operating profit is forecast to slide 2.6% YoY, weighed down by a weak 1H due to: 1) the delayed release of new lineups, and 2) poor yields from the newly operated plant. Still, we see higher margins in 2H than in 1H with the launch of new tablet models and the full operation of the firm's new plant.

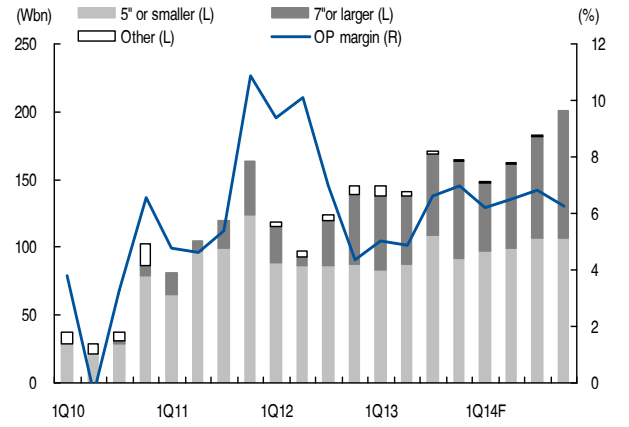
Downside pressures on ASP due to intense competition will make a return to double-digit margins unlikely. Also, with tax deductions on losses carried forward scheduled to end this year, net profit is likely to contract despite fast top-line growth.

Table 26. Quarterly and annual earnings (under consolidated K-IFRS) (Wbn, %, %p)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Revenue	172.5	157.9	198.3	189.8	171.6	182.6	209.5	216.7	718.5	780.5	813.7
Touchscreen panel	168.0	153.3	193.8	185.2	166.8	177.6	204.3	211.3	700.2	760.0	791.2
≤ 5"	44.6	48.4	49.7	49.4	49.0	52.4	56.0	57.0	192.1	214.4	245.3
≥ 7"	123.4	104.8	144.1	135.9	117.8	125.2	148.4	154.3	508.2	545.7	545.9
Other	4.5	4.6	4.6	4.6	4.8	5.0	5.2	5.4	18.3	20.4	22.5
Proportion of revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
TSP	97.4	97.1	97.7	97.6	97.2	97.3	97.5	97.5	97.5	97.4	97.2
Other	2.6	2.9	2.3	2.4	2.8	2.7	2.5	2.5	2.5	2.6	2.8
Operating profit	14.7	12.8	18.3	17.1	13.6	15.2	18.6	18.6	62.9	66.1	67.8
OP margin	8.5	8.1	9.2	9.0	8.0	8.3	8.9	8.6	8.8	8.5	8.3
Net profit	16.9	12.1	15.4	14.0	11.0	11.9	14.7	14.7	58.3	52.3	53.8
Net margin	9.8	7.7	7.8	7.4	6.4	6.5	7.0	6.8	8.1	6.7	6.6
Growth (QoQ/YoY)											
Revenue	11.5	-8.5	25.6	-4.3	-9.6	6.4	14.7	3.4	20.5	8.6	4.3
TSP	13.4	-8.8	26.4	-4.4	-10.0	6.5	15.0	3.4	24.3	8.5	4.1
≤ 5"	72.8	8.7	2.6	-0.7	-0.8	7.1	6.7	1.9	12.7	11.6	14.4
≥ 7"	0.9	-15.1	37.5	-5.7	-13.3	6.3	18.5	4.0	29.3	7.4	0.0
Other	-31.0	1.9	-1.4	0.0	5.4	4.0	4.0	3.9	-44.6	11.6	10.2
Operating profit	3.9	-12.6	42.4	-6.6	-20.1	11.4	22.4	-0.2	-2.6	5.0	2.5
Net profit	11.7	-28.3	27.3	-9.0	-21.1	7.7	23.7	-0.2	-9.0	-10.4	2.9

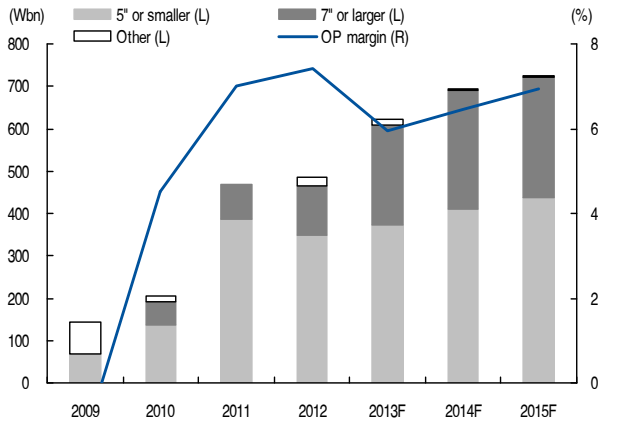
Source: Company data, KDB Daewoo Securities Research

Figure 106. Quarterly revenue and OP



Source: Company data, KDB Daewoo Securities Research

Figure 107. Annual revenue and OP



Source: Company data, KDB Daewoo Securities Research

Iljin Display (020760 KS/TP: W22,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**597**	**719**	**781**	**814**
Cost of Sales	**505**	**630**	**686**	**717**
Gross Profit	**92**	**88**	**95**	**97**
SG&A Expenses	**27**	**25**	**28**	**29**
Operating Profit (Adj)	**65**	**63**	**66**	**68**
Operating Profit	**65**	**63**	**66**	**68**
Non-Operating Profit	**-5**	**1**	**-1**	**-1**
Net Financial Income	1	0	0	0
Net Gain from Inv in Associates	0	0	0	0
Pretax Profit	60	64	65	67
Income Tax	-5	5	13	14
Profit from Continuing Operations	**64**	**58**	**52**	**54**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**64**	**58**	**52**	**54**
Controlling Interests	64	58	52	54
Non-Controlling Interests	0	0	0	0
Total Comprehensive Profit	**63**	**58**	**52**	**54**
Controlling Interests	63	58	52	54
Non-Controlling Interests	0	0	0	0
EBITDA	74	75	80	83
FCF (Free Cash Flow)	62	-14	22	27
EBITDA Margin (%)	12.4	10.4	10.3	10.2
Operating Profit Margin (%)	10.8	8.8	8.5	8.3
Net Profit Margin (%)	10.8	8.1	6.7	6.6

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**158**	**163**	**197**	**225**
Cash and Cash Equivalents	53	34	50	72
AR & Other Receivables	75	101	115	120
Inventories	25	22	25	26
Other Current Assets	1	1	1	1
Non-Current Assets	**114**	**170**	**195**	**220**
Investments in Associates	1	1	1	1
Property, Plant and Equipment	87	144	170	195
Intangible Assets	18	18	18	18
Total Assets	**273**	**333**	**392**	**445**
Current Liabilities	**114**	**121**	**133**	**137**
AP & Other Payables	78	80	91	95
Short-Term Financial Liabilities	33	33	33	33
Other Current Liabilities	3	8	9	9
Non-Current Liabilities	**8**	**8**	**8**	**9**
Long-Term Financial Liabilities	**4**	**4**	**4**	**4**
Other Non-Current Liabilities	0	0	0	1
Total Liabilities	**122**	**129**	**141**	**146**
Controlling Interests	**151**	**204**	**250**	**299**
Capital Stock	**14**	**14**	**14**	**14**
Capital Surplus	36	36	36	36
Retained Earnings	102	155	202	250
Non-Controlling Interests	**0**	**0**	**0**	**0**
Stockholders' Equity	**151**	**204**	**250**	**299**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**97**	**56**	**62**	**68**
Net Profit	64	58	52	54
Non-Cash Income and Expense	21	17	28	29
Depreciation	9	12	14	15
Amortization	0	0	0	0
Others	-12	1	0	0
Chg in Working Capital	12	-14	-5	-2
Chg in AR & Other Receivables	-31	-26	-14	-5
Chg in Inventories	-4	3	-3	-1
Chg in AP & Other Payables	36	2	11	4
Income Tax Paid	0	-5	-13	-14
Cash Flows from Inv Activities	**-43**	**-69**	**-40**	**-40**
Chg in PP&E	-36	-69	-40	-40
Chg in Intangible Assets	0	0	0	0
Chg in Financial Assets	-6	0	0	0
Others	-2	0	0	0
Cash Flows from Fin Activities	**-23**	**-6**	**-6**	**-6**
Chg in Financial Liabilities	-20	0	0	0
Chg in Equity	2	0	0	0
Dividends Paid	-3	-6	-6	-6
Others	-2	0	0	0
Increase (Decrease) in Cash	**31**	**-19**	**17**	**22**
Beginning Balance	21	53	34	50
Ending Balance	53	34	50	72

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	9.4	8.5	9.5	9.2
P/CF (x)	8.2	7.0	7.4	7.2
P/B (x)	4.5	2.7	2.1	1.8
EV/EBITDA (x)	8.0	6.7	6.0	5.6
EPS (W)	2,356	2,064	1,850	1,904
CFPS (W)	2,705	2,490	2,358	2,435
BPS (W)	4,865	6,579	8,226	9,927
DPS (W)	200	200	200	200
Payout ratio (%)	8.5	9.7	10.8	10.5
Dividend Yield (%)	0.9	1.1	1.1	1.1
Revenue Growth (%)	83.9	20.5	8.6	4.3
EBITDA Growth (%)	69.1	1.2	7.3	2.9
Operating Profit Growth (%)	77.6	-2.6	5.0	2.5
EPS Growth (%)	104.4	-12.4	-10.4	2.9
Accounts Receivable Turnover (x)	12.4	9.7	8.5	8.1
Inventory Turnover (x)	22.6	30.7	33.1	31.7
Accounts Payable Turnover (x)	15.8	12.8	12.8	12.3
ROA (%)	28.3	19.3	14.4	12.9
ROE (%)	53.3	32.9	23.0	19.6
ROIC (%)	55.2	35.4	24.7	22.4
Liability to Equity Ratio (%)	80.7	63.2	56.4	48.9
Current Ratio (%)	139.6	134.8	147.9	163.7
Net Debt to Equity Ratio (%)	-13.8	-0.9	-7.4	-13.5
Interest Coverage Ratio (x)	44.6			

Source: Company data, KDB Daewoo Securities Research estimates

S-MAC (097780 KQ)

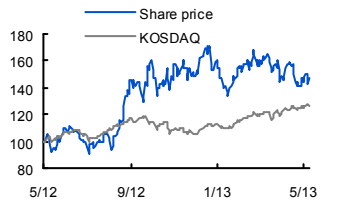
Margins to steadily pick up after bottoming in 2Q

Display

(Initiate)	Trading Buy
Target Price (12M, W)	18,000
Share Price (05/31/13, W)	15,250
Expected Return	18%

OP (13F, Wbn)	37
Consensus OP (13F, Wbn)	42
EPS Growth (13F, %)	1.5
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	8.3
Market P/E (13F, x)	9.6
KOSDAQ	577.87
Market Cap (Wbn)	263
Shares Outstanding (mn)	17
Free Float (%)	72.9
Foreign Ownership (%)	9.2
Beta (12M)	1.10
52-Week Low (W)	9,890
52-Week High (W)	18,050

(%)	1M	6M	12M
Absolute	-6.7	-3.4	43.4
Relative	-8.6	-6.9	34.8



2H outlook: Stiffer competition in small panels to limit margin gains

We expect S-MAC to continue its solid top-line growth, driven by robust smartphone sales and tablet market share gains by the firm's major customer, SEC. On the back of the growing popularity of the Galaxy series, SEC has continued to expand its global share in the mid- to low-end smartphone and tablet segments. In 2013, SEC's smartphone and tablet shipments are forecast to jump to 280mn units (30% YoY) and 35.5mn units (131% YoY), respectively.

Although the increasing size of smartphone screens is expected to push up ASP for small- and medium-sized touchscreen modules, the current standard GFF-based touchscreen is likely to lose ground with the widespread adoption of new touchscreen technologies (G1F, etc.). Furthermore, the competitive landscape will likely worsen, as more cost-competitive Chinese makers are aggressively moving into the market. As a result, we think any margin pickup will likely be slow despite the expected benefits from increased internal sourcing of ITO sensors aided by new plant construction.

Catalysts: 1) Large touch panels, 2) ITO-sensor internal sourcing effect in 2H

In 2013, top line will likely be driven by shipments of medium- to large-sized (7" or above) touchscreens for tablet PCs, which we forecast to jump 157% YoY to 71mn units. As such, medium- to large-sized touchscreen revenue is expected to soar 102% YoY to W235.4bn, even amid annual ASP declines of nearly 20%.

The firm's new Pyeongtaek and Asan plants, set to be completed in 2Q, will likely take full effect in 2H. The capacity addition should increase the proportion of internally sourced ITO sensors to almost 90% (vs. 36% currently), leading to steady margin improvements. The company has been trying to save costs by internalizing manufacturing processes (it bought a 41.5% stake in the tempered-glass producer BST in 2012), which should help drive up margins going forward.

Valuation: Initiate coverage with Trading Buy and TP of W18,000

We initiate coverage on S-MAC with a Trading Buy recommendation and a target price of W18,000. Despite robust revenue growth backed by strong touchscreen demand and in-house sourcing of ITO sensors, we believe margins will pick up only gradually due to stiffening competition in film-type touchscreens. We derived our target price by applying a P/E of 11x to our 12-month forward EPS of W1,749.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	222	447	485	622	695	726
OP (Wbn)	13	37	36	37	45	50
OP Margin (%)	6.0	8.2	7.4	5.9	6.5	6.9
NP (Wbn)	14	35	27	27	34	39
EPS (W)	1,046	2,236	1,554	1,578	1,989	2,236
ROE (%)	39.3	53.7	28.1	22.6	22.9	21.0
P/E (x)	6.6	4.1	10.8	8.3	6.6	5.8
P/B (x)	2.3	1.9	2.7	1.7	1.4	1.1

Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

Company overview

S-MAC is a manufacturer of touch input devices (touchscreen modules, touch key modules, etc.) featured in mobile devices. Split off from Samsung Electro-Mechanics (SEMCO) in November 2004, the firm was listed on the KOSDAQ in January 2008.

The company has seven business sites: Hwaseong (headquarters), Cheonan, Pyeongtaek, and Asan (construction to be completed in 2Q) in Korea and Tianjin and Dongguan in China. As of end-1Q, the firm had monthly capacity of 5.2mn units for touchscreen modules and 2.1mn units for ITO sensors.

S-MAC was more geared toward key modules during its earlier years, but moved into the touchscreen business full force in 2008, beginning with shipments for use SEC's first-ever capacitive touchscreen models, the Soul and TouchWiz phones. Currently, the company supplies touchscreen modules for more than 30 different devices (ranging from mobile phones to tablet PCs).

More than 90% of S-MAC's revenue comes from SEC (75% of SEC-related revenue comes from 5" or smaller touchscreen modules for mobile phones; the remaining 25% from 7" or larger modules for tablet PCs). Looking ahead, we believe the company will gradually diversify its customer base, and product mix will shift towards higher-priced 7" and larger touchscreen modules in line with rising tablet PC demand.

Figure 108. Supply for use in major models

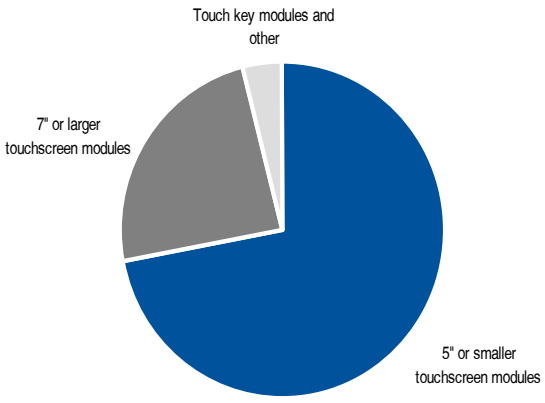
Source: Company data

Figure 109. Corporate history

Year	Month	Event
2004	Nov.	S-MAC was established
	Dec.	Received key module business from SEMCO
2005	Feb.	Registered as a top-priority partner of SEC
	Aug.	Became SEC's ECO partner
2007	Jan.	Established factory in Tianjin, China
2008	Jan.	Listed on KOSDAQ
	Sep.	Established factory in Dongguan, China
2009	Mar.	Relocated to new Hwaseong factory
	May	Established a plant in Cheonan
2010	Nov.	Established a plant in Pyeongtaek
2011	Mar.	Established an alliance of SEC partners
2012	Sep.	Established factory in Chilgoe, Pyeongtaek
	Dec.	Established a plant in Asan

Source: Company data

Figure 110. Revenue breakdown by product (2012)



Source: Company data

Investment keys: 1) Large touch panels, 2) internal ITO-sensor supply in 2H

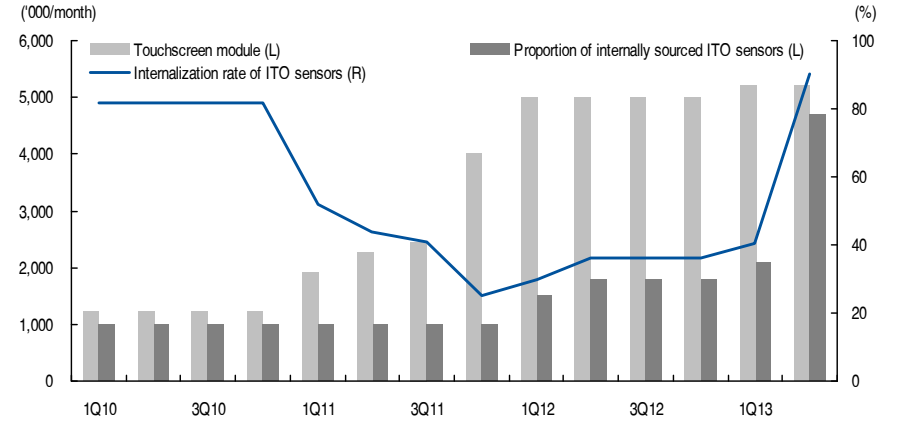
In 2013, top line will likely be driven by shipments of medium- to large-sized (7" or above) touchscreens for tablet PCs. We forecast shipments of 7" and larger touchscreens to jump 157% YoY to 71mn units, boosted by SEC's robust tablet PC sales. As such, even with an annual ASP decline of nearly 20% we expect medium- to large-sized touch-panel revenue to soar 102% YoY to W235.4bn, contributing 87% of 2013F incremental revenue.

On the other hand, we see 5"-and-below touchscreen revenue inching up just 6.6% YoY to W372.6bn for 2013. This is because market share is likely to decline as a result of the broader adoption of GFF alternative technologies and intensifying competition from Chinese makers, even though ASP is likely to rise on an increase in average screen size.

The firm's new Pyeongtaek and Asan plants, set to be completed in 2Q, will likely take full effect in 2H. As of end-2012, the company's touchscreen module capacity stood at 5.2mn units per month, but ITO sensor capacity was far lower at 1.8mn units per month (implying only 36% of the firm's ITO sensor needs are internally produced). The newly added capacity should increase the proportion of internally sourced ITO sensors to almost 90%, leading to steady margin improvements.

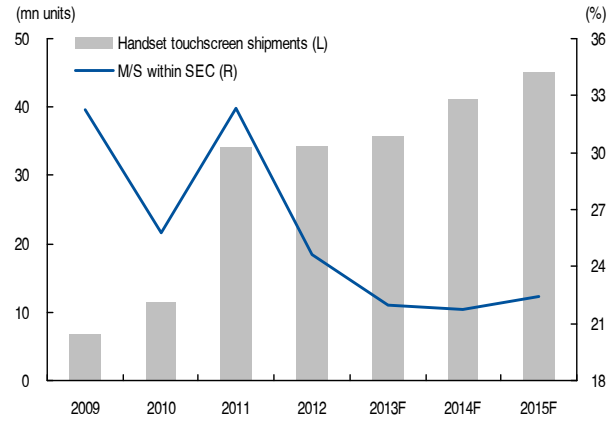
We note that S-MAC has been making efforts to save costs by internalizing manufacturing processes (such as buying a 41.5% stake in the tempered glass producer BST in 2012), a move that should help drive margins going forward.

Figure 111. Capacity and proportion of internally sourced ITO sensors



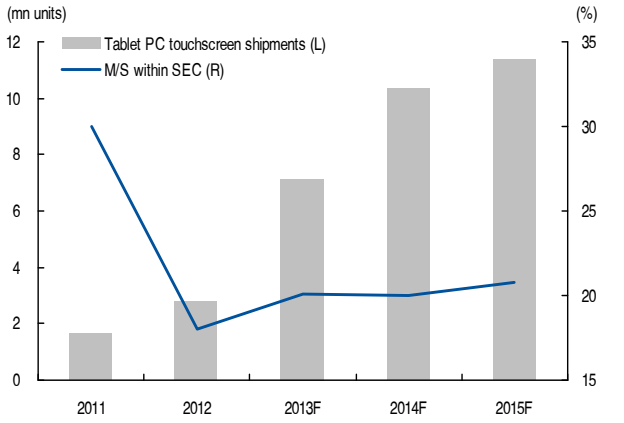
Source: Company data, KDB Daewoo Securities Research

Figure 112. Smartphone touchscreen panel M/S within SEC



Source: Company data, KDB Daewoo Securities Research

Figure 113. Tablet PC touchscreen panel M/S within SEC



Source: Company data, KDB Daewoo Securities Research

2013F earnings: Revenue of W621.7bn (+28%), OP of W36.9bn (+3%)

For 2013, we forecast revenue at W621.7bn (+28.1% YoY) and operating profit at W36.9bn (+2.6% YoY). We expect top-line growth to continue on the back of SEC's increasing sales of mid- to low-end smartphones, a larger average screen size, and robust growth in tablet PCs. That said, despite solid shipment growth, fiercer competition will likely put persistent downside pressureson prices, slowing down revenue growth from 2014.

We believe margins will likely stay muted in 1H due to production yield issues following new model roll-outs and plant construction. In 2H, however, we expect yields to stabilize, and thus expect the internal sourcing of ITO sensors to begin showing positive effects, steadily driving up margins. We project OP margin to pick up to the 6% range in 2H from the 4% range in 1H.

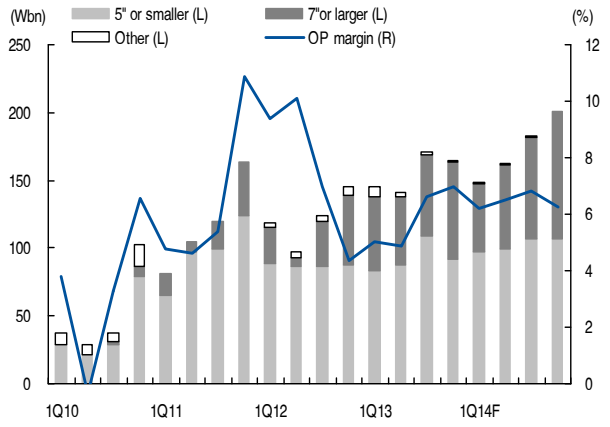
That said, we are conservative on the pace of margin growth, as stiffer competition is likely to cause market share losses and downside pricing pressures.

Table 27. Quarterly and annual earnings (under consolidated K-IFRS) (Wbn, %, %p)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Revenue	145.3	141.0	170.5	165.0	148.5	162.3	182.7	201.3	621.7	694.8	725.5
Touchscreen panel	137.7	137.7	168.7	164.0	147.6	161.4	181.9	200.5	608.1	691.3	722.2
5"~	83.6	87.7	109.0	92.3	97.6	99.2	106.8	107.3	372.6	410.8	438.4
~7"	54.0	50.0	59.8	71.7	50.0	62.2	75.0	93.3	235.4	280.5	283.9
Other	7.6	3.4	1.7	1.0	1.0	0.9	0.8	0.8	13.7	3.4	3.2
Proportion of revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Touchscreen	94.8	97.6	99.0	99.4	99.4	99.5	99.5	99.6	97.8	99.5	99.6
Others	5.2	2.4	1.0	0.6	0.6	0.5	0.5	0.4	2.2	0.5	0.4
Operating profit	7.3	6.9	11.3	11.5	9.2	10.6	12.4	12.6	36.9	44.8	50.4
OP margin	5.0	4.9	6.6	7.0	6.2	6.5	6.8	6.2	5.9	6.5	6.9
Net profit	5.8	4.9	8.1	8.4	7.1	8.1	9.5	9.6	27.2	34.2	38.5
Net margin	4.0	3.5	4.8	5.1	4.8	5.0	5.2	4.8	4.4	4.9	5.3
Growth (QoQ/YoY)											
Revenue	0.2	-2.9	20.8	-3.2	-10.0	9.3	12.6	10.2	28.1	11.8	4.4
Touchscreen panel	-1.0	0.0	22.5	-2.8	-10.0	9.4	12.7	10.2	30.4	13.7	4.5
5"~	-4.6	4.9	24.2	-15.3	5.7	1.7	7.7	0.4	6.6	10.2	6.7
~7"	5.1	-7.5	19.6	19.9	-30.2	24.5	20.6	24.3	102.0	19.2	1.2
Other	29.5	-55.8	-48.1	-42.9	-4.3	-6.2	-6.4	-8.0	-29.0	-74.8	-6.5
Operating profit	15.8	-6.4	64.4	1.9	-19.7	15.2	17.3	1.0	2.6	21.5	12.3
Net profit	34.1	-14.6	65.1	3.4	-15.1	13.1	17.5	1.3	1.5	26.0	12.4

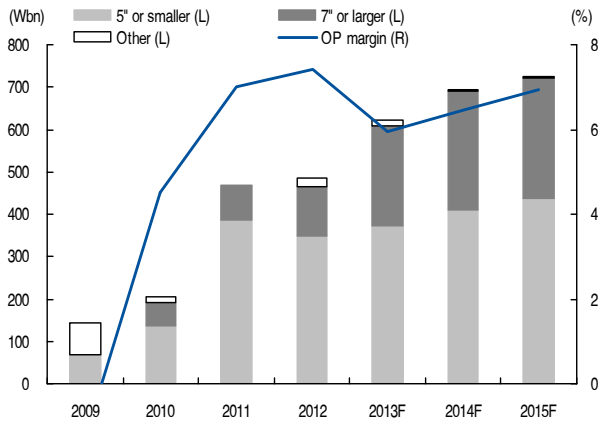
Source: Company data, KDB Daewoo Securities Research

Figure 114. Quarterly earnings



Source: Company data, KDB Daewoo Securities Research

Figure 115. Annual earnings



Source: Company data, KDB Daewoo Securities Research

S-MAC (097780 KQ/TP: W18,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**485**	**622**	**695**	**726**
Cost of Sales	**436**	**566**	**629**	**654**
Gross Profit	**50**	**56**	**66**	**72**
SG&A Expenses	**14**	**19**	**21**	**22**
Operating Profit (Adj)	**36**	**37**	**45**	**50**
Operating Profit	**36**	**37**	**45**	**50**
Non-Operating Profit	**-2**	**-2**	**-1**	**-1**
Net Financial Income	0	0	0	0
Net Gain from Inv in Associates	-1	0	0	0
Pretax Profit	34	35	44	49
Income Tax	7	8	10	11
Profit from Continuing Operations	**27**	**27**	**34**	**39**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**27**	**27**	**34**	**39**
Controlling Interests	27	27	34	39
Non-Controlling Interests	0	0	0	0
Total Comprehensive Profit	**26**	**27**	**34**	**39**
Controlling Interests	26	27	34	39
Non-Controlling Interests	0	0	0	0
EBITDA	41	46	56	62
FCF (Free Cash Flow)	29	-7	17	20
EBITDA Margin (%)	8.4	7.4	8.0	8.6
Operating Profit Margin (%)	7.4	5.9	6.5	6.9
Net Profit Margin (%)	5.5	4.4	4.9	5.3

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**117**	**151**	**193**	**216**
Cash and Cash Equivalents	38	31	46	63
AR & Other Receivables	45	78	95	99
Inventories	24	28	35	36
Other Current Assets	9	13	16	17
Non-Current Assets	**77**	**102**	**115**	**133**
Investments in Associates	11	11	11	11
Property, Plant and Equipment	64	90	103	121
Intangible Assets	1	1	1	1
Total Assets	**193**	**252**	**307**	**349**
Current Liabilities	**79**	**110**	**131**	**137**
AP & Other Payables	62	79	97	101
Short-Term Financial Liabilities	11	11	11	11
Other Current Liabilities	7	20	24	25
Non-Current Liabilities	**7**	**9**	**10**	**11**
Long-Term Financial Liabilities	**5**	**5**	**5**	**5**
Other Non-Current Liabilities	2	4	5	6
Total Liabilities	**86**	**119**	**142**	**148**
Controlling Interests	**107**	**133**	**166**	**201**
Capital Stock	**8**	**8**	**8**	**8**
Capital Surplus	12	12	12	12
Retained Earnings	87	113	146	181
Non-Controlling Interests	**0**	**0**	**0**	**0**
Stockholders' Equity	**107**	**133**	**166**	**201**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**67**	**28**	**42**	**50**
Net Profit	27	27	34	39
Non-Cash Income and Expense	14	19	22	24
Depreciation	5	9	11	12
Amortization	0	0	0	0
Others	-1	0	1	1
Chg in Working Capital	34	-9	-5	-1
Chg in AR & Other Receivables	4	-33	-17	-4
Chg in Inventories	6	-4	-6	-2
Chg in AP & Other Payables	29	18	17	4
Income Tax Paid	-8	-8	-10	-11
Cash Flows from Inv Activities	**-49**	**-35**	**-24**	**-30**
Chg in PP&E	-36	-35	-24	-30
Chg in Intangible Assets	0	0	0	0
Chg in Financial Assets	-1	0	0	0
Others	-12	0	0	0
Cash Flows from Fin Activities	**0**	**-1**	**-2**	**-3**
Chg in Financial Liabilities	3	0	0	0
Chg in Equity	0	0	0	0
Dividends Paid	-2	-1	-2	-3
Others	0	0	0	0
Increase (Decrease) in Cash	**17**	**-8**	**16**	**17**
Beginning Balance	21	38	31	47
Ending Balance	38	31	47	64

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	10.8	8.3	6.6	5.8
P/CF (x)	9.1	6.3	5.0	4.5
P/B (x)	2.7	1.7	1.4	1.1
EV/EBITDA (x)	6.5	4.6	3.5	2.8
EPS (W)	1,554	1,578	1,989	2,236
CFPS (W)	1,929	2,089	2,623	2,933
BPS (W)	6,205	7,736	9,625	11,663
DPS (W)	50	100	200	200
Payout ratio (%)	3.0	6.3	10.0	8.9
Dividend Yield (%)	0.3	0.8	1.5	1.5
Revenue Growth (%)	8.7	28.1	11.8	4.4
EBITDA Growth (%)	1.3	11.8	22.0	11.9
Operating Profit Growth (%)	-1.8	2.6	21.5	12.3
EPS Growth (%)	-30.5	1.5	26.0	12.4
Accounts Receivable Turnover (x)	9.1	10.6	8.4	7.8
Inventory Turnover (x)	17.8	23.8	22.1	20.5
Accounts Payable Turnover (x)	9.7	9.8	8.6	8.0
ROA (%)	15.3	12.2	12.2	11.7
ROE (%)	28.1	22.6	22.9	21.0
ROIC (%)	37.4	30.7	29.2	28.4
Liability to Equity Ratio (%)	80.6	89.1	85.3	73.6
Current Ratio (%)	147.8	137.4	146.7	158.1
Net Debt to Equity Ratio (%)	-21.8	-11.9	-19.2	-24.3
Interest Coverage Ratio (x)	92.6			

Source: Company data, KDB Daewoo Securities Research estimates

MNtech (095500 KQ)

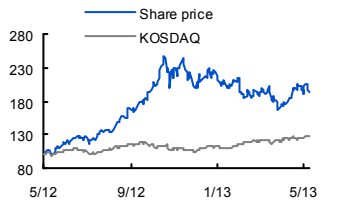
The worst is over

Display

(Maintain)	Trading Buy
Target Price (12M, W)	13,000
Share Price (05/31/13, W)	10,900
Expected Return	19%

OP (13F, Wbn)	17
Consensus OP (13F, Wbn)	
EPS Growth (13F, %)	-32.4
Market EPS Growth (13F, %)	21.9
P/E (13F, x)	13.1
Market P/E (13F, x)	9.6
KOSDAQ	577.87
Market Cap (Wbn)	254
Shares Outstanding (mn)	23
Free Float (%)	67.9
Foreign Ownership (%)	11.1
Beta (12M)	0.71
52-Week Low (W)	5,610
52-Week High (W)	14,100

(%)	1M	6M	12M
Absolute	9.7	-16.8	82.3
Relative	7.8	-20.3	73.7



2H outlook: Key lies in expanding metal mesh customer base

At the moment, the best way to address the significant resistance of ITO in large touchscreens for notebooks and PC monitors is either OGS or metal mesh technology. The widespread adoption of metal mesh technology depends on manufacturers' ability to make line widths thinner than 3μm (currently 6μm), which would eliminate the moiré effect on high-resolution panels. The increasing number of new entrants in the market does represent a concern; foreign suppliers like Atmel, UniPixel (manufactured by Kodak), 3M, Fujifilm, MasTouch and Young Fast have been gearing up to move into the metal mesh market, while several domestic firms, such as LG Chem and ELK (modules), are preparing for mass production. However, unlike its rivals, MNtech has the advantage of possessing high-bandwidth roll-to-roll equipment. In 2H, the company's performance will hinge on whether it adds foreign PC-makers to its client list.

Catalysts: 1) TV optical film shipments, 2) global PC-maker approval

In 1Q, TV-use optical-film shipments slumped 20% on customer destocking and tepid TV sales in developed countries. However, we see optical film revenue and profit picking up in 2Q on restocking and improved TV sales.

MNtech began shipping metal mesh touchscreens for use in SEC's all-in-one PCs in 2H12. Metal mesh revenue totaled W15bn in 4Q12, but has consistently been on the decline in 1H13. We thus believe the company is in urgent need of expanding its customer base beyond SEC. Global PC makers, including Lenovo and HP, are currently conducting sample tests on the firm's product.

Valuation: Maintain Trading Buy with TP of W13,000

We maintain our Trading Buy call with a TP of W13,000. In 1Q13, MNtech swung to an operating loss of W2bn on consolidated revenue of W67.3bn (-16% QoQ, -5% YoY). Losses at subsidiaries were the main cause behind the 1Q consolidated loss. Effective this year, the company has started releasing consolidated earnings, which reflect the results of six of its subsidiaries (Surface Tech, SKC MNT, and Kuang Young Technology). Non-consolidated 1Q revenue and operating profit were in line with our projections at W59bn and W2.2bn, respectively.

For 2Q, we project consolidated revenue at W86.9bn (+29% QoQ, +18% YoY) and operating profit at W5.4bn. We forecast optical film revenue to climb 46% QoQ to W66bn, aided by TV panel shipment growth. Accelerated revenue growth should drive down fixed costs and thus boost margins; however, we remain conservative on the TV optical film market in 2H, as the end of China's energy-saving subsidies should cool TV demand in the country. We see limited upside to MNtech's share prices until the firm's metal mesh touchscreens can get completely back on track.

FY (Dec.)	12/10	12/11	12/12	12/13F	12/14F	12/15F
Revenue (Wbn)	282	274	334	329	359	397
OP (Wbn)	27	9	34	17	24	29
OP Margin (%)	9.5	3.2	10.2	5.2	6.8	7.3
NP (Wbn)	23	8	27	18	20	25
EPS (W)	984	344	1,111	751	844	1,017
ROE (%)	14.1	5.0	14.8	9.0	9.4	10.4
P/E (x)	9.2	15.9	10.6	13.1	11.7	9.7
P/B (x)	1.3	0.8	1.5	1.2	1.1	1.0

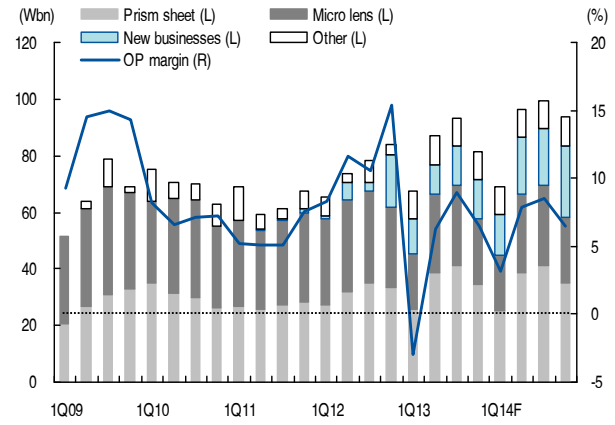
Notes: All figures are based on consolidated K-IFRS; NP refers to profit attributable to controlling interests
Source: Company data, KDB Daewoo Securities Research estimates

Table 28. Quarterly and annual earnings (under consolidated K-IRFS) (Wbn, %)

	1Q13	2Q13F	3Q13F	4Q13F	1Q14F	2Q14F	3Q14F	4Q14F	2013F	2014F	2015F
Avg. US$/W rate	1,084	1,095	1,070	1,065	1,065	1,065	1,065	1,065	1,079	1,065	1,065
Shipment area (km2)	8,608	12,529	13,288	11,340	8,823	13,155	13,686	11,680	45,764	47,345	49,712
ASP (US$/m2)	4.9	4.8	4.9	4.8	4.8	4.7	4.8	4.7	4.8	4.7	4.6
Revenue (Wbn)	67.3	86.9	93.3	81.5	69.2	96.5	99.6	93.6	329.1	358.9	397.3
Optical film	45.3	66.4	69.3	57.5	44.7	66.5	69.6	58.1	238.6	238.9	243.3
New businesses	12.5	10.5	14.0	14.0	14.5	20.0	20.0	25.5	51.0	80.0	114.0
Retroreflective film	1.0	1.5	2.0	2.0	2.0	2.5	2.5	3.0	6.5	10.0	12.0
Touchscreen panel	9.5	7.0	10.0	10.0	10.0	15.0	15.0	20.0	36.5	60.0	90.0
Window film	2.0	2.0	2.0	2.0	2.5	2.5	2.5	2.5	8.0	10.0	12.0
Other	9.5	10.0	10.0	10.0	10.0	10.0	10.0	10.0	39.5	40.0	40.0
Operating profit	-2.0	5.4	8.4	5.3	2.2	7.6	8.4	6.1	17.1	24.3	28.8
OP margin	-2.9	6.2	9.0	6.5	3.1	7.9	8.5	6.5	5.2	6.8	7.2
Net profit	2.2	4.6	6.9	4.5	2.0	6.3	7.0	5.1	18.2	20.4	24.6
Net margin	3.3	5.3	7.4	5.5	2.9	6.6	7.0	5.5	5.5	5.7	6.2

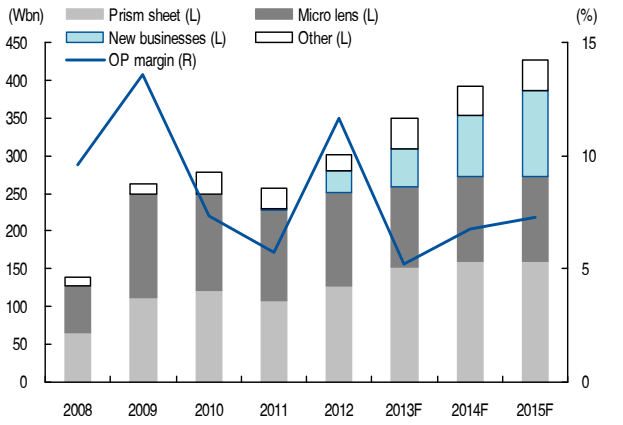
Source: Company data, KDB Daewoo Securities Research

Figure 116. Quarterly earnings



Source: Company data, KDB Daewoo Securities Research

Figure 117. Annual earnings



Source: Company data, KDB Daewoo Securities Research

MNtech (095500 KQ/TP: W13,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Revenue	**334**	**329**	**359**	**397**
Cost of Sales	**255**	**270**	**286**	**318**
Gross Profit	**79**	**60**	**73**	**79**
SG&A Expenses	**45**	**42**	**48**	**50**
Operating Profit (Adj)	**34**	**17**	**24**	**29**
Operating Profit	**34**	**17**	**24**	**29**
Non-Operating Profit	**-3**	**6**	**1**	**1**
Net Financial Income	1	0	0	0
Net Gain from Inv in Associates	1	0	0	0
Pretax Profit	31	23	26	30
Income Tax	6	5	5	5
Profit from Continuing Operations	**25**	**18**	**20**	**25**
Profit from Discontinued Operations	0	0	0	0
Net Profit	**25**	**18**	**20**	**25**
Controlling Interests	27	18	20	25
Non-Controlling Interests	-2	0	0	0
Total Comprehensive Profit	**25**	**18**	**20**	**25**
Controlling Interests	28	18	20	25
Non-Controlling Interests	-3	0	0	0
EBITDA	49	34	45	52
FCF (Free Cash Flow)	0	-17	-3	14
EBITDA Margin (%)	14.8	10.4	12.6	13.0
Operating Profit Margin (%)	10.2	5.2	6.8	7.3
Net Profit Margin (%)	8.1	5.5	5.7	6.2

Statement of Financial Condition (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Current Assets	**186**	**184**	**194**	**222**
Cash and Cash Equivalents	65	53	47	61
AR & Other Receivables	61	64	73	81
Inventories	30	38	43	48
Other Current Assets	9	10	11	12
Non-Current Assets	**159**	**182**	**196**	**199**
Investments in Associates	8	8	8	8
Property, Plant and Equipment	106	124	137	139
Intangible Assets	17	17	17	17
Total Assets	**345**	**366**	**390**	**421**
Current Liabilities	**124**	**120**	**128**	**134**
AP & Other Payables	43	44	51	56
Short-Term Financial Liabilities	70	70	70	70
Other Current Liabilities	11	7	8	8
Non-Current Liabilities	**20**	**29**	**29**	**32**
Long-Term Financial Liabilities	**16**	**25**	**25**	**29**
Other Non-Current Liabilities	3	3	3	3
Total Liabilities	**144**	**149**	**156**	**166**
Controlling Interests	**193**	**209**	**226**	**248**
Capital Stock	**12**	**12**	**12**	**12**
Capital Surplus	85	85	85	85
Retained Earnings	108	124	141	163
Non-Controlling Interests	**8**	**8**	**8**	**8**
Stockholders' Equity	**201**	**216**	**234**	**255**

Cash Flows (Summarized)

(Wbn)	12/12	12/13F	12/14F	12/15F
Cash Flows from Op Activities	**26**	**16**	**31**	**39**
Net Profit	31	18	20	25
Non-Cash Income and Expense	21	16	25	27
Depreciation	15	17	21	23
Amortization	1	0	0	0
Others	-5	10	5	5
Chg in Working Capital	-21	-13	-10	-7
Chg in AR & Other Receivables	-16	-3	-9	-8
Chg in Inventories	-8	-7	-6	-5
Chg in AP & Other Payables	10	1	7	5
Income Tax Paid	-5	-5	-5	-5
Cash Flows from Inv Activities	**-44**	**-36**	**-34**	**-25**
Chg in PP&E	-37	-36	-34	-25
Chg in Intangible Assets	-2	0	0	0
Chg in Financial Assets	-11	0	0	0
Others	6	0	0	0
Cash Flows from Fin Activities	**19**	**7**	**-3**	**0**
Chg in Financial Liabilities	19	0	0	0
Chg in Equity	-2	0	0	0
Dividends Paid	-1	-3	-3	-3
Others	4	0	0	0
Increase (Decrease) in Cash	**1**	**-12**	**-6**	**14**
Beginning Balance	64	65	53	47
Ending Balance	65	53	47	61

Forecasts/Valuations (Summarized)

	12/12	12/13F	12/14F	12/15F
P/E (x)	10.6	13.1	11.7	9.7
P/CF (x)	6.7	6.8	5.8	5.0
P/B (x)	1.5	1.2	1.1	1.0
EV/EBITDA (x)	5.8	7.6	5.9	5.0
EPS (W)	1,111	751	844	1,017
CFPS (W)	1,745	1,456	1,702	1,960
BPS (W)	7,757	8,405	9,131	10,012
DPS (W)	110	130	150	0
Payout ratio (%)	9.3	15.6	16.1	0.0
Dividend Yield (%)	0.9	1.3	1.5	0.0
Revenue Growth (%)	21.7	-1.4	9.1	10.7
EBITDA Growth (%)	125.6	-30.8	32.0	14.5
Operating Profit Growth (%)	287.1	-49.8	42.3	18.4
EPS Growth (%)	223.2	-32.4	12.4	20.5
Accounts Receivable Turnover (x)	6.3	5.3	5.3	5.2
Inventory Turnover (x)	12.6	9.7	8.9	8.8
Accounts Payable Turnover (x)	13.1	10.1	9.8	9.6
ROA (%)	8.3	5.1	5.4	6.1
ROE (%)	14.8	9.0	9.4	10.4
ROIC (%)	18.8	7.4	9.2	10.3
Liability to Equity Ratio (%)	71.9	68.9	66.7	65.0
Current Ratio (%)	149.7	153.1	152.2	165.8
Net Debt to Equity Ratio (%)	0.1	10.1	12.0	6.9
Interest Coverage Ratio (x)	12.1			

Source: Company data, KDB Daewoo Securities Research estimates

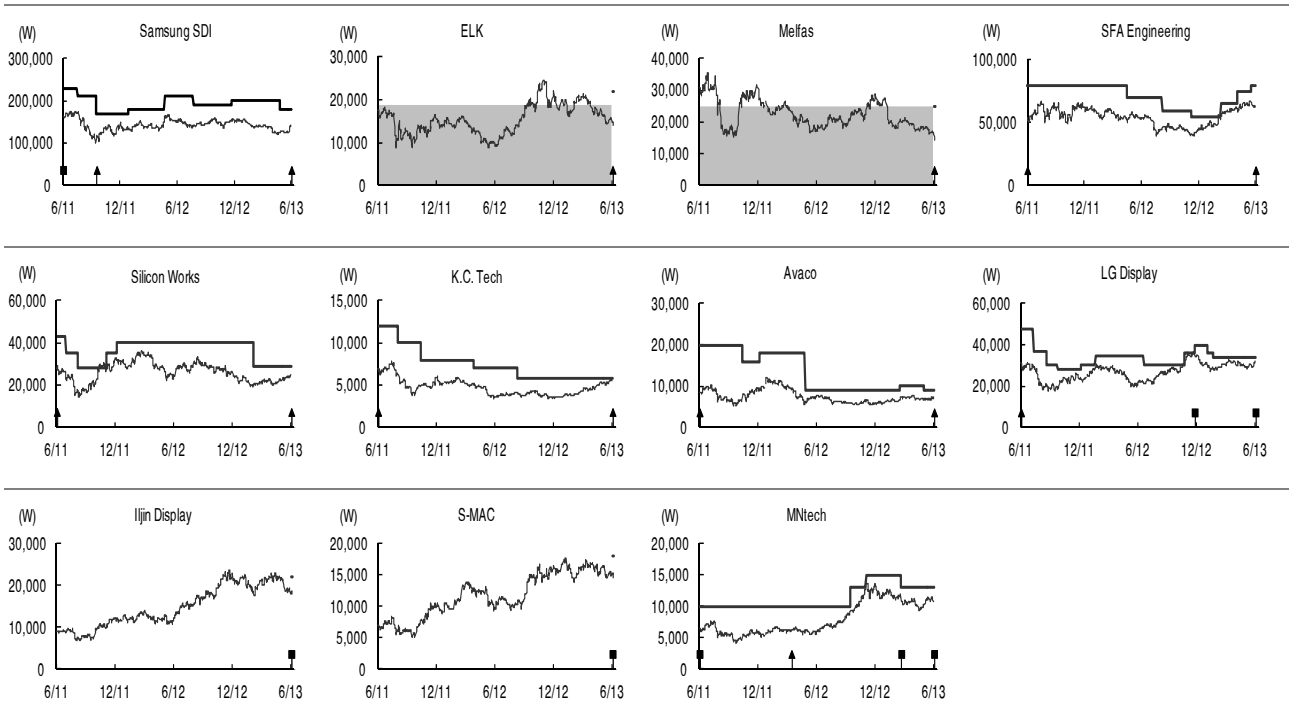
Important Disclosures & Disclaimers

Disclosures

As of the publication date, Daewoo Securities Co., Ltd. has acted as a liquidity provider for equity-linked warrants backed by shares of Samsung SDI and LG Display as an underlying asset, and other than this, Daewoo Securities has no other special interests in the covered companies.
As of the publication date, Daewoo Securities Co., Ltd. has been acting as a financial advisor to SFA Engineering for its treasury stock trust, and other than this, Daewoo Securities has no other special interests in the companies covered in this report.
As of the publication date, Daewoo Securities Co., Ltd. issued equity-linked warrants with Samsung SDI and LG Display as an underlying asset, and other than this, Daewoo Securities has no other special interests in the covered companies.

Stock Ratings		Industry Ratings	
Buy	Relative performance of 20% or greater	Overweight	Fundamentals are favorable or improving
Trading Buy	Relative performance of 10% or greater, but with volatility	Neutral	Fundamentals are steady without any material changes
Hold	Relative performance of -10% and 10%	Underweight	Fundamentals are unfavorable or worsening
Sell	Relative performance of -10%		

* Ratings and Target Price History (Share price (----), Target price (----), Not covered (■), Buy (▲), Trading Buy (■), Hold (●), Sell (◆))
* Our investment rating is a guide to the relative return of the stock versus the market over the next 12 months.
* Although it is not part of the official ratings at Daewoo Securities, we may call a trading opportunity in case there is a technical or short-term material development.
* The target price was determined by the research analyst through valuation methods discussed in this report, in part based on the analyst's estimate of future earnings.
The achievement of the target price may be impeded by risks related to the subject securities and companies, as well as general market and economic conditions.



Analyst Certification

The research analysts who prepared this report (the "Analysts") are registered with the Korea Financial Investment Association and are subject to Korean securities regulations. They are neither registered as research analysts in any other jurisdiction nor subject to the laws and regulations thereof. Opinions expressed in this publication about the subject securities and companies accurately reflect the personal views of the Analysts primarily responsible for this report. Daewoo Securities Co., Ltd. policy prohibits its Analysts and members of their households from owning securities of any company in the Analyst's area of coverage, and the Analysts do not serve as an officer, director or advisory board member of the subject companies. Except as otherwise specified herein, the Analysts have not received any compensation or any other benefits from the subject companies in the past 12 months and have not been promised the same in connection with this report. No part of the compensation of the Analysts was, is, or will be directly or indirectly related to the specific recommendations or views contained in this report but, like all employees of Daewoo Securities, the Analysts receive compensation that is impacted by overall firm profitability, which includes revenues from, among other business units, the institutional equities, investment banking, proprietary trading and private client division. At the time of publication of this report, the Analysts do not know or have reason to know of any actual, material conflict of interest of the Analyst or Daewoo Securities Co., Ltd. except as otherwise stated herein.

Disclaimers

This report is published by Daewoo Securities Co., Ltd. ("Daewoo"), a broker-dealer registered in the Republic of Korea and a member of the Korea Exchange. Information and opinions contained herein have been compiled from sources believed to be reliable and in good faith, but such information has not been independently verified and Daewoo makes no guarantee, representation or warranty, express or implied, as to the fairness, accuracy, completeness or correctness of the information and opinions contained herein or of any translation into English from the Korean language. If this report is an English translation of a report prepared in the Korean language, the original Korean language report may have been made available to investors in advance of this report. Daewoo, its affiliates and their directors, officers, employees and agents do not accept any liability for any loss arising from the use hereof. This report is for general information purposes only and it is not and should not be construed as an offer or a solicitation of an offer to effect transactions in any securities or other financial instruments. The intended recipients of this report are sophisticated institutional investors who have substantial knowledge of the local business environment, its common practices, laws and accounting principles and no person whose receipt or use of this report would violate any laws and regulations or subject Daewoo and its affiliates to registration or licensing requirements in any jurisdiction should receive or make any use hereof. Information and opinions contained herein are subject to change without notice and no part of this document may be copied or reproduced in any manner or form or redistributed or published, in whole or in part, without the prior written consent of Daewoo. Daewoo, its affiliates and their directors, officers, employees and agents may have long or short positions in any of the subject securities at any time and may make a purchase or sale, or offer to make a purchase or sale, of any such securities or other financial instruments from time to time in the open market or otherwise, in each case either as principals or agents. Daewoo and its affiliates may have had, or may be expecting to enter into, business relationships with the subject companies to provide investment banking, market-making or other financial services as are permitted under applicable laws and regulations. The price and value of the investments referred to in this report and the income from them may go down as well as up, and investors may realize losses on any investments. Past performance is not a guide to future performance. Future returns are not guaranteed, and a loss of original capital may occur.

Distribution

United Kingdom: This report is being distributed by Daewoo Securities (Europe) Ltd. in the United Kingdom only to (i) investment professionals falling within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (the "Order"), and (ii) high net worth companies and other persons to whom it may lawfully be communicated, falling within Article 49(2)(A) to (E) of the Order (all such persons together being referred to as "Relevant Persons"). This report is directed only at Relevant Persons. Any person who is not a Relevant Person should not act or rely on this report or any of its contents.

United States: This report is distributed in the U.S. by Daewoo Securities (America) Inc., a member of FINRA/SIPC, and is only intended for major institutional investors as defined in Rule 15a-6(b)(4) under the U.S. Securities Exchange Act of 1934. All U.S. persons that receive this document by their acceptance thereof represent and warrant that they are a major institutional investor and have not received this report under any express or implied understanding that they will direct commission income to Daewoo or its affiliates. Any U.S. recipient of this document wishing to effect a transaction in any securities discussed herein should contact and place orders with Daewoo Securities (America) Inc., which accepts responsibility for the contents of this report in the U.S. The securities described in this report may not have been registered under the U.S. Securities Act of 1933, as amended, and, in such case, may not be offered or sold in the U.S. or to U.S. persons absent registration or an applicable exemption from the registration requirements.

Hong Kong: This document has been approved for distribution in Hong Kong by Daewoo Securities (Hong Kong) Ltd., which is regulated by the Hong Kong Securities and Futures Commission. The contents of this report have not been reviewed by any regulatory authority in Hong Kong. This report is for distribution only to professional investors within the meaning of Part I of Schedule 1 to the Securities and Futures Ordinance of Hong Kong (Cap. 571, Laws of Hong Kong) and any rules made thereunder and may not be redistributed in whole or in part in Hong Kong to any person.

All Other Jurisdictions: Customers in all other countries who wish to effect a transaction in any securities referenced in this report should contact Daewoo or its affiliates only if distribution to or use by such customer of this report would not violate applicable laws and regulations and not subject Daewoo and its affiliates to any registration or licensing requirement within such jurisdiction.

KDB Daewoo Securities International Network

Daewoo Securities Co. Ltd. (Seoul)
Head Office
34-3 Yeouido-dong, Yeongdeungpo-gu
Seoul 150-716
Korea
Tel: 82-2-768-3026

Daewoo Securities (Hong Kong) Ltd.
Two International Finance Centre
Suites 2005-2012
8 Finance Street, Central
Hong Kong
Tel: 85-2-2514-1304

Daewoo Securities (America) Inc.
600 Lexington Avenue
Suite 301
New York, NY 10022
United States
Tel: 1-212-407-1022

Daewoo Securities (Europe) Ltd.
Tower 42, Level 41
25 Old Broad Street
London EC2N 1HQ
United Kingdom
Tel: 44-20-7982-8016

Daewoo Securities (Singapore) Pte. Ltd.
6 Battery road, #11-01
Singapore, 049909
Tel: 65-6671-9845

Tokyo Representative Office
7th Floor, Yusen Building
2-3-2 Marunouchi, Chiyoda-ku
Tokyo 100-0005
Japan
Tel: 81-3- 3211-5511

Beijing Representative Office
Suite 2602, Twin Towers (East)
B-12 Jianguomenwai Avenue
Chaoyang District, Beijing 100022
China
Tel: 86-10-6567-9699

Shanghai Representative Office
Unit 13, 28th Floor, Hang Seng Bank Tower
1000 Lujiazui Ring Road
Pudong New Area, Shanghai 200120
China
Tel: 86-21-5013-6392

Ho Chi Minh Representative Office
Centec Tower
72-74 Nguyen Thi Minh Khai Street
Ward 6, District 3, Ho Chi Minh City
Vietnam
Tel: 84-8-3910-6000