Universal Display Corp. (NASDAQ:PANL)

PANL - Playing the OLED Inflection Point in Smartphones

MARKET OUTPERFORM

CommTech					July 21, 2011
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		FYE - Dec	2010A	2011E	2012E
Price ($)	30.01	1Q	(0.10)A	(0.04)A	NE
52 Wk Range ($)	12.51-63.58	2Q	(0.05)A	(0.01)	NE
Price Target ($)	40.00	3Q	(0.10)A	0.01	NE
Market Cap ($mil)	1,362.0	4Q	0.01A	0.12	NE
Enterprise Value ($mil)	1,037	FY EPS ($)	(0.26)A	0.10	1.07
Avg. Daily Vol. (000s)	1,000	y/y % chg	NA	NA	970%
Price / Book	3.8x	FY EPS Consensus ($)	NE	0.19	0.98
Cash Per Share ($)	8.35	FY EBITDA ($mil)	(1.4)A	5.3	52.3
Net Debt / Cap.	0%	FY REV ($mil)	30.5A	48.2	102.9
Insider Ownership	8%	y/y % chg	93%	58%	113%
Shares Out (mil)	45.4				
Shares Short (mil)	4.7	CY EPS ($)	(0.26)A	0.10	1.07
Float (mil)	42.0	CY P/E	NM	300.1x	28.0x
Short % of Float	11.2%	CY EV/EBITDA	NM	195.7x	19.8x
Div($)/Yield(%)	0.00/0.0%				

Action

We are initiating coverage on New Jersey-based Universal Display (NASDAQ: PANL). PANL holds key patents and exclusive licenses on OLED (organic light emitting diode) display technology, specifically PHOLED (phosphorescent OLED). We view smartphones as the near term opportunity with tablets, TVs, and lighting driving long term growth. We believe OLED's 15% energy efficiency gains per color versus traditional LCDs and its thin form factor will drive adoption by CE manufacturers. While PANL does not provide guidance, we expect 29% OLED penetration in the 630m unit 2012 smartphone market (vs. 300m 2010) which translates to $1.07 non-GAAP 2012 EPS. Given its patent licensing business model, a rapidly growing market, and a bulletproof balance sheet, we are initiating coverage with a Market Outperform rating and a $40 price target.

Key Investment Highlights

- **OLED Market Reaching Inflection Point -** Smartphones account for the majority of OLED usage today and are expected to drive a $4-5 billion OLED display market in 2012. Samsung's new $2.2 billion fabrication facility, the largest OLED plant to date, came online in May and we believe Samsung could spend up to $3 billion on OLEDs over the next two years. With Samsung's additional capacity and LG's smaller facility operational, we expect increased implementation of OLEDs in their respective products and adoption by other smartphone OEMs. We estimate a 1% increase in OLED adoption by smartphone OEMs yields up to $0.05 incremental EPS in 2012, and we estimate Samsung's new facility could generate ~$115m in annual revenues for PANL assuming full capacity.
- **Cashing In On The Patent Portfolio -** PANL owns key PHOLED patents, of which the most important do not begin expiring until 2017. We estimate PANL currently receives $0.22 in chemical sales and royalties per smartphone (assuming a $25 display ASP). PANL supplies chemical materials for every PHOLED display sold, which it prices at ~$500 per gram, and collects a royalty estimated at 0.45% (per color) of the display ASP . Display manufacturers today only use PANL's phosphorescent red and depend on fluorescent material for green and blue. PANL recently reported 400,000 lifetime hours for its green materials, close to LCD lifetimes (500,000 hours), and we believe display manufacturers could begin using PANL's green material by 2012.
- **An Attractive Business Model -** With its high margin licensing model and solid balance sheet, PANL is strategically positioned to benefit from the OLED inflection point. We estimate gross margins on chemical sales are approximately 90%, and we believe that net margins could be in the 30% range, similar to IP licensor DLB. Following a recent secondary offering, PANL has $325 million in cash and equivalents on its balance sheet and no debt. With the acceleration of smartphone, tablet, and TV opportunities, we believe PANL's attractive margins and solid, debt free balance sheet warrant a higher valuation relative to its peer group.

Important Disclosures on Page 20

Executive Summary

	Commercial				Development		
	Chemical	Royalty	License	Commercialization Assistance	Chemical	Research	Technology Development
Revenue ($ in MM)							
2010A	5.7	3.5	1.2	0.8	11.5	5.0	2.9
2011E	14.3	9.2	3.9	0.8	12.1	6.0	1.9
2012E	39.5	34.1	6.8	0.9	14.0	6.3	1.9
% of total FY11 rev.	30%	19%	8%	2%	25%	12%	4%
% of total FY12 rev.	38%	33%	7%	1%	14%	6%	2%
2011E growth:	150%	164%	237%	6%	5%	20%	-36%
2012E growth:	175%	272%	75%	5%	15%	5%	5%
2011E rev growth:	154%				3%		
2012E rev growth:	186%				11%		
Description	PANL supplies organic chemicals used in OLED fabrication. (90% gross margin)	~0.45% of display ASPs per color. Royalty reports are received 60 days after quarter end.	Amortized premiums on chemical sales to customers without royalty agreements.	Customization of materials and device architecture assistance.	Organic chemicals used in development applications are classified as such. (90% gross margin)	Contract research commissioned by government agencies.	Development of display and lighting technologies with improved effiencies and extended lifetimes.
Market Perspective:							
2012E Market Size	$4.5B		NA	NA	NA	NA	NA
Est. 2012-2015 CAGR	25%		NA	NA	NA	NA	NA
Growth Drivers	Increased OLED adoption. Availability of phosphorescent greens and blues.	Increased OLED adoption. Royalty rate increases.	NA	NA	Development of new applications, such as large-area displays or lighting panels.	NA	NA
Key Competitors	BASF, LG, Sumitomo Chemical				NA		
Example Customers	Samsung Mobile Display (75% 2010 rev.)				LG Display, AU Optronics	DoE, DoD	Sony

Key Investment Positives

I. OLED Market Reaching Inflection Point

DisplaySearch estimates the total display market to be over $110 billion. OLED's penetration today is minimal - the 2010 OLED market was estimated to be $1 billion, or about 40 million displays - leaving ample room for growth in an industry that has not seen a technology shift since the middle of the last decade, when it became apparent that LCD (liquid crystal display) would replace CRT (cathode ray tube) technology. LCDs have been widely adopted and are so cost-efficient to produce that manufacturers are realizing losses from their LCD divisions. CE manufacturers are familiar with OLED displays, but have not implemented them meaningfully due to inadequate supply. We believe recent investments in new facilities by display manufacturers and long term plans for the technology will drive near term adoption of small-area displays. We expect a $4-5 billion market in 2012 as penetration ramps and the global display market grows to $120 billion.

Smartphones account for the majority of OLED usage today and are expected to continue driving the OLED market until 2013/2014, at which point we expect OLED penetration in tablets to ramp. Including the $2.2 billion already spent on building its recently launched fabrication facility, Samsung could invest up to $3 billion in OLED production over the next 2 years. LG is also building a smaller fabrication facility and expects to announce investments in the largest OLED facility to date once it has developed technology suitable for high volume and cost efficient OLED TV manufacturing.

Near term, we estimate that a 1% increase in OLED adoption by smartphone OEMs yields up to $0.05 incremental EPS in 2012, and we expect Samsung's new facility could generate ~$115m in annual revenues assuming full capacity. The following table demonstrates EPS sensitivity to OLED penetration in smartphones.

2012 EPS Sensitivity to Smartphone Penetration						
		OLED Share of Smartphone Market				
		27%	28%	29%	30%	31%
Smartphone Shipments	575	$0.83	$0.88	$0.93	$0.98	$1.03
	600	$0.89	$0.94	$0.99	$1.04	$1.09
	630	$0.96	$1.01	$1.07	$1.12	$1.17
	650	$1.00	$1.06	$1.12	$1.17	$1.23
	675	$1.06	$1.12	$1.18	$1.24	$1.29

II. Cashing In On The Patent Portfolio

PANL's business model allows it to benefit from the growth of the display market with minimal selling and marketing efforts. Near term, we believe the smartphone market will drive PANL's top-line growth and we view tablets as the next opportunity, though the tablet market remains relatively small today and we do not expect implementation of OLEDs in tablets until 2013/2014. We view OLED TVs and lighting as wild-cards. While they have the potential to generate substantial revenues for PANL, the technology required for high volume and cost efficient production is not yet available.

1. The Smartphone Opportunity - Gartner and IDC estimate ~300 million smartphones were sold worldwide in 2010 and their respective forecasts through 2015 represent CAGRs of 25-30%. In 2015, approximately one billion smartphones are expected to be sold, double the amount expected in 2011. Smartphone manufacturers have been the earliest commercial adopters of OLED technology and we believe smartphones will be the first devices to experience widespread adoption.

Samsung has been the most committed early adopter and recently began production in a multi-billion dollar fabrication facility. Samsung uses OLED displays in many of its new smartphones, including the recently launched Galaxy S2. Its predecessor, the Galaxy S, sold 10 million units. Other smartphone OEMs also use or want to use OLED displays in their products, but global supply shortages have limited OLED adoption. For example, HTC's Droid Incredible used an OLED display when it was first released, but display shortages forced HTC to replace the screen with Sony's Super LCD. The following table shows global March quarter market share for the top five smartphone OEMs and Avondale estimates for 2011 and 2012.

Figure 1 - Smartphone Market Share by OEM

Smartphone Market Share by OEM			
	1Q11A	2011E	2012E
Nokia	24.3%	18.0%	12.0%
Apple	18.7%	19.0%	20.0%
RIM	14.0%	13.0%	12.0%
Samsung	10.8%	16.0%	20.0%
HTC	8.9%	11.0%	14.0%
Others	23.3%	23.0%	22.0%

Source: Avondale estimates, IDC

A July 2010 iSuppli component breakdown for Apple's iPhone 4 estimated the retina display to cost $28.50, and a February 2011 breakdown by iSuppli suggested that cost may have declined slightly. More recently, DisplaySearch estimated the Super AMOLED+ in Samsung's Galaxy line of phones cost ~$25, and UBM TechInsights estimated the display price of the Motorola Droid 2 to be ~$20. We view this as a likely indicator that at this size, OLED displays are being priced competitively against high quality LCDs, and remain slightly more expensive than traditional lower quality LCDs (thin film transistor LCDs, or TFT LCDs). The following table compares smartphones with different display technologies.

Figure 2 - Smartphone Displays and Specs

	Samsung Galaxy S2	Apple iPhone 4	Motorola Droid 2
Display	Super AMOLED+	Retina Display	TFT LCD
Display size	4.3"	3.5"	3.7"
Resolution (pixels)	800 x 480	960 x 640	854 x 480
Display cost estimate	$25	$27	$20

Note: The Motorola Droid 2 features a sliding keyboard and form factor is not comparable.
Source: Avondale estimates, DisplaySearch, iSuppli, UBM TechInsights, Samsung, Apple, Motorola

PANL sells the phosphorescent materials used in the displays and chemical material revenues depend on the number of phosphorescent colors used by display manufacturers. Customers currently only use PANL's red material. PANL prices the materials at approximately $500 per gram, which is estimated to be enough material to produce 4,000-6,000 displays. Our model assumes 4,500 displays per gram of material and that customers will begin using green phosphor emitters towards the end of 2011.

We estimate PANL charges a royalty of ~0.45% per color of the display ASP, currently ~$0.11 per smartphone display which we expect may increase to ~$0.22 by 2012. The royalty rate is based on the number of phosphorescent colors used, and although red is currently the only phosphorescent emitter in use, we believe Samsung will adopt phosphorescent green given lifetimes now approaching those of traditional LCDs. Royalty

payments are lagged as PANL receives reports 60 days after the end of the quarter. The following table shows our royalty and material revenue expectations for 2011, and demonstrates that PANL stands to gain from both increased OLED penetration and overall smartphone market growth.

2011 Incremental Royalty and Material Revenues ($ mil)						
		OLED Share of Smartphone Market				
		19%	20%	21%	22%	23%
Smartphone Shipments	350	16.5	17.4	18.3	19.1	20.0
	400	18.9	19.9	20.9	21.9	22.9
	450	21.2	22.3	23.5	24.6	25.7
	500	23.6	24.8	26.1	27.3	28.6
	550	25.9	27.3	28.7	30.1	31.5

2. Tablets & Other CE Devices - Tablet shipments have grown rapidly since Apple's iPad was first released and growth is expected to accelerate. Gartner estimates close to 300m tablets will ship in 2015, compared to ~18m in 2010, representing a CAGR of ~75%. Apple's iPad is the current market leader but Android powered tablets are expected to grow in popularity. Our model assumes Apple will continue using its advanced LCD displays, and we believe OLED penetration will eventually accelerate driven by Android adoption on tablets. Samsung demonstrated that it is capable of producing tablet sized displays at FPD International in November 2010 where it brought its 7" Galaxy Tab with an OLED display. We believe production will continue to specialize on smartphone sized displays and will be implemented in tablets 2H12.

3. Televisions and Lighting - Long term, we view television and lighting as wild cards. Television royalties could be greater than for smartphones on a per unit basis given the cost differential, and the amount of chemical material required in fabricating larger displays. Production of larger displays is not cost-efficient today, and therefore not suitable for mainstream adoption. However, with ongoing efforts to improve production processes and realize economies of scale, we estimate OLED TVs could begin shipping in the back half of 2013, though these sets will be prohibitively expensive and destined for early adopters. Prices are not expected to be competitive with LCD and plasma until at least 2015. Therefore, we do not anticipate meaningful revenues for PANL until the second half of the decade at which point OLED TVs could succeed LCD and LED TVs. The following table illustrates potential revenues from OLED TVs in 2015. Notice that despite a smaller unit base and lower penetration than with smartphones, revenues could be more meaningful due to larger surface areas and greater ASPs.

2015 Incremental OLED TV Revenues ($ mil)						
		OLED TV Market Share				
		2%	3%	4%	5%	6%
Flat Panel TV Shipments	290	22.4	33.6	44.8	56.0	67.2
	300	23.2	34.8	46.3	57.9	69.5
	310	23.9	35.9	47.9	59.8	71.8
	320	24.7	37.1	49.4	61.8	74.1
	330	25.5	38.2	51.0	63.7	76.5

Lighting is a ~$75b market globally, with the US accounting for about 20% of the total. While average consumers today may be reluctant to pay an upfront premium for energy efficient lighting, incandescent bulbs are set to be discontinued and the lighting market will become completely energy efficient once inventories are liquidated. Energy efficient lighting currently exists in the form of energy saving incandescents, compact fluorescent lights (CFL) and inorganic LEDs. However, OLED lighting is expected to be the most energy efficient, and offers an unmatched form factor: flat, flexible panels.

III. Energy Efficiency and Form Factor To Drive Innovation in Mobile Devices

As consumers continue to adopt mobile devices with increasingly sophisticated functionality, new components such as the LTE standard are likely to require more power and may occupy more space in slimmer devices. Early adopters of HTC's 4G LTE smartphone, which uses an LCD display, complained of sub-par battery life. Anecdotally, initial revues of Verizon's second LTE device, the Samsung Charge with a Super AMOLED+ display, favorably mentioned improved battery life.

PANL estimates phosphorescent OLEDs generate ~15% energy efficiency gains per color compared to traditional LCDs, and we expect the energy savings offered by OLEDs will drive adoption in mobile devices,

namely smartphones and tablets, as bandwidth intensive data components consume more power. OLED displays, essentially thin films of organic molecules on a substrate, emit light and do not require back-lighting which drives energy savings but also reduces their size. As the first generations of 4G technology are implemented, components are likely to more voluminous than 3G parts.

PANL's phosphorescent OLEDs are theoretically 4x more energy efficient than fluorescent OLEDs and we expect display manufacturers will adopt each color as lifetime requirements are met. We believe green may be adopted towards the December or March quarters given recent advances to 400,000 lifetime hours, rivaling LCD technology. With estimated 30% efficiency gains when using two PANL colors and an almost paper thin form factor, we expect OEMs to implement OLEDs as they seek to differentiate themselves with power hungry functionalities.

Key Investment Concerns

- **Patent Invalidation -** PANL's business is contingent upon the validity of its intellectual property rights. Should its patents be ruled invalid, PANL's business would be adversely affected. PANL patents are currently being challenged in Korea, Japan, and Europe, but we have no additional color and expect lengthy legal processes.
- **Technology Risk -** While OLED development has progressed significantly and is already commercially available, new technologies could prove to be more cost-effective or more advanced and could render OLEDs obsolete. Just as liquid crystal displays (LCD) replaced cathode ray tube displays (CRT), next generation display technologies could threaten the OLED market.

Valuation & Conclusion

PANL is currently trading at 29x our CY12 EPS estimate vs. ROVI at 18x and DTSI at 17x, we are initiating coverage with a Market Outperform rating. A comparables analysis is difficult to apply due to 2010 losses and minimal 2011 earnings relative to long term expectations. We are substituting calculated EPS growth in 2011 and 2012 with our long term annualized expectation of 10%.

The peer group consists of Microsoft, Google, Qualcomm, Adobe, Nuance, Dolby, and DTS.

Figure 3 - Relative Valuation

	EPS						
	Multiples			PEG		EV/EBITDA	
	2010A	2011E	2012E	2011E	2012E	2011E	2012E
PANL	NM	302.8x	28.3x	30.3x	2.8x	198.1x	20.1x
Peer Median	20.1x	16.9x	14.3x	0.9x	0.7x	11.9x	8.4x
NASDAQ 100	14.3x	16.6x	14.3x	1.2x	1.0x	not available	

Source: Avondale Partners, FactSet

We are also applying a DCF analysis to PANL under different growth scenarios: a best case, worst case, and our expectations.

Despite a history of minimal commercial revenues, we believe the OLED market is nearing an inflection point. We are forecasting 58% and 113% growth in total revenues for CY11 and CY12, respectively. These elevated growth rates reflect the recent successes of OLED devices and a relatively small revenue base. We believe growth will be driven by continued OLED penetration within the smartphone market compounded by ~50% market growth in CY11 and ~30% market growth in CY12 . We do not expect developmental revenues to grow meaningfully in absolute terms, and as the market matures we expect this segment to decline.

Our revenue forecasts include a 25% CAGR through 2015, largely attributable to smartphones and tablets, and a 10% CAGR through 2020 driven by higher revenue generating OLED TVs. We are assuming 30% net margins,

which we believe to be conservative compared with other licensing models such as DLB. Lastly, we are assuming a 2% long-term growth rate, roughly in-line with nominal GDP.

Our baseline assumption for the cost of equity capital is 13.5%. This is derived using the CAPM with a beta of 1.5 (estimated using 2 years of historical data), a risk free rate of 3.0% (roughly where 10-year Treasuries trade today), and an equity risk premium of 7.0% (above the typical 5.5%, reflecting current market conditions).

Figure 4 - Price Target: DCF Valuation Matrix

Terminal Growth Rate	Cost of Equity Capital				
	12.5%	13.0%	13.5%	14.0%	14.5%
1.0%	$ 41.14	$ 39.86	$ 38.68	$ 37.58	$ 36.55
1.5%	$ 42.30	$ 40.93	$ 39.66	$ 38.49	$ 37.39
2.0%	$ 43.58	$ 42.10	$ 40.73	$ 39.47	$ 38.30
2.5%	$ 44.99	$ 43.38	$ 41.90	$ 40.54	$ 39.29
3.0%	$ 46.54	$ 44.78	$ 43.18	$ 41.71	$ 40.36

FCF Estimates	
FY11	$6.0M
FY12	$49.3M
FY13	$48.6M
FY14	$60.2M
FY15	$74.3M

Best Case -
Our best case scenario reflects increased revenue and net margins relative to our estimates. Should the OLED smartphone, tablet, and TV markets grow more rapidly than our expectations with net margins greater than our 30% estimate, we believe PANL would warrant a valuation in the $60 range.

Our assumptions maintain 58% and 113% revenue growth in CY11 and CY12, respectively, 40% rev. growth in 2013-2015 (vs. 25% Avondale), and 15% in 2016-2020 (vs. 10% Avondale). Additionally, we assume 35% net margins (vs. 30% Avondale). Our long-term growth rate remains unchanged from 2%, as does our cost of equity capital at 13.5%.

Figure 5 - Best Case Price Target: DCF Valuation Matrix

Terminal Growth Rate	Cost of Equity Capital				
	12.5%	13.0%	13.5%	14.0%	14.5%
1.0%	$ 59.50	$ 57.51	$ 55.66	$ 53.94	$ 52.34
1.5%	$ 61.34	$ 59.19	$ 57.21	$ 55.37	$ 53.66
2.0%	$ 63.35	$ 61.03	$ 58.89	$ 56.92	$ 55.09
2.5%	$ 65.56	$ 63.04	$ 60.73	$ 58.60	$ 56.64
3.0%	$ 68.01	$ 65.25	$ 62.74	$ 60.44	$ 58.32

FCF Estimates	
FY11	$6.0M
FY12	$49.3M
FY13	$60.4M
FY14	$82.6M
FY15	$112.8M

Worst Case -
Our worst case scenario maintains CY11 and CY12 estimates, with 15% rev. growth in 2013-2015 (vs. 25% Avondale) and 10% rev. growth in 2016-2020 (vs. 20% Avondale). We are assuming 25% net margins (vs. 30% Avondale), and our long-term growth rate remains at 2% with a cost of equity capital at 13.5%.

Figure 6- Worst Case Price Target: DCF Valuation Matrix

Terminal Growth Rate	Cost of Equity Capital				
	12.5%	13.0%	13.5%	14.0%	14.5%
1.0%	$ 31.97	$ 31.05	$ 30.20	$ 29.41	$ 28.67
1.5%	$ 32.81	$ 31.82	$ 30.91	$ 30.06	$ 29.27
2.0%	$ 33.73	$ 32.66	$ 31.67	$ 30.77	$ 29.92
2.5%	$ 34.73	$ 33.57	$ 32.51	$ 31.53	$ 30.63
3.0%	$ 35.85	$ 34.58	$ 33.43	$ 32.37	$ 31.40

FCF Estimates	
FY11	$6.0M
FY12	$49.3M
FY13	$39.6M
FY14	$46.0M
FY15	$53.1M

Company Overview

Universal Display (NASDAQ: PANL) is a leader in the research, development, and commercialization of phosphorescent OLED (organic light emitting diode) technologies and materials. PANL's primary business is to further develop and license its proprietary PHOLED technologies and materials to manufacturers for display applications, such as smartphones, tablets, televisions, and lighting products. PANL conducts internal research and development and maintains relationships with research institutions such as Princeton University,

the University of Southern California, and the University of Michigan where PANL funds research and retains patent rights to technologies arising from it. PANL's business is broken into commercial and developmental segments, but as OLED gains momentum, we believe the commercial segment will eclipse development.

Commercial revenues include the sale of chemicals for commercial applications as well as royalty and license fees from OEMs. Royalty payments represent a percentage of the display ASP, and license fees are amortized premiums on chemical sales to customers with which PANL does not have a royalty agreement. PANL's most important relationship is with Samsung. In May 2010, Samsung announced that it was investing ~$2.2 billion into a Gen 5.5 AMOLED production facility, and on May 31, 2011, the facility went online two months ahead of schedule.

The developmental segment consists of contract research and the sale of chemicals for the purpose of research and development. PANL has entered into several US government contracts where it conducts research to develop OLED technologies for various Department of Defense (DOD) agencies and the Department of Energy (DOE). The DOD is interested in flexible technologies that can be used as wrist-mounted communication devices and displays for use by Air Force pilots. The DOE is interested in high efficiency white lighting.

Key Customers
Samsung and LG collectively accounted for 58% of PANL's 2010 revenues, and Samsung is estimated to have generated ~40% of 2010 revenues. Near term, PANL's performance will be correlated with the success of Samsung's AMOLED displays since they will continue to account for the majority of OLED production. As previously mentioned, Samsung recently opened a multi-billion dollar AMOLED fabrication facility which will be capable of producing 30 million 3" displays every month assuming full capacity.

For comparison, LG Display recently began production in a facility estimated to be capable of producing 3 million 3" displays per month. LG is also working on the technology behind OLED TVs and expects to announce CapEx investments once a suitable technology is selected, possibly towards the end of 2011 or beginning of 2012.

Another company heading into the AMOLED space is Taiwan-based AU Optronics. AU Optronics was formed via the merger of Acer Display and Unipac Optoelectronics and is currently the world's third largest manufacturer of TFT-LCDs. AU Optronics had experimented with AMOLED production, but reverted back to LCD's shortly thereafter, and is now expected to begin AMOLED mass production in the back half of 2011.

Figure 7 - Employee Overview

Function	Count
R&D	63
SG&A	21
Patents	3
Royalty and Licensing	3
Total	**~90**

Source: PANL, Avondale estimates

Figure 8 - Company Timeline

Time Period	Event
1996	IPO at $5 per share.
2001	Begin providing PHOLED materials to Samsung SMD for evaluation.
2004	Secondary offering of 2.5m shares ($12/share).
2005	Entered into patent license agreement with Samsung SMD.
2007	Entered into material supply agreement with LG.
	Seconday offering of 2.8m shares ($14.50/share).
2008	Formed Universal Display Corporation Hong Kong.
2009	Awarded $4m Department of Energy contract.
2010	Samsung announces plans to build $2.2 billion fabrication facility.
	Formed Universal Display Corporation Korea.
	Delivered prototype of wrist mounted flexible display to the US Army.
2011	Formed Universal Display Corporation Japan.
	Secondary offering of 5.75m shares ($46/share).

Source: PANL filings

I. What is OLED?

OLEDs (organic light emitting diodes) are devices consisting of a series of organic thin films sandwiched between two thin-film conductive electrodes that create light with the application of current.

The principle behind OLEDs is that current flowing through organic molecules via electrodes on the top and bottom will charge the molecules, and if a positive and negative charge hit the same charged molecule, a photon is released and we see it as light.

OLED devices use active matrix or passive matrix technology, active matrix being the more popular of the two. An active matrix OLED (AMOLED) device retains the color of each pixel until it is changed, whereas passive matrix devices refresh each pixel individually. AMOLED devices contain a TFT (thin film transistor) layer which itself contains a storage capacitor to maintain the line pixel states.

Passive matrix OLED's have electrodes in rows and columns where the intersections form pixels. Since there is no storage capacitor, each pixel row must be lit individually and one at a time which limits their size (1" – 3" typically) and increases their power consumption. However, they are much cheaper to produce than AMOLEDs.

Universal Display's technology is PHOLED, or phosphorescent OLED, which can be used to create both AMOLED and PMOLED. Eastman Kodak Company developed and patented the original fluorescent OLED technology in 1987. Fluorescent OLEDs have the same advantages as PHOLED in terms of weight and flexibility, but they are not nearly as energy efficient. Universal Display estimates that phosphorescent OLED can achieve theoretical efficiency of 100% while its fluorescent counterpart is limited to 25% theoretical efficiency. With power consumption a growing concern, we expect PHOLED colors to be adopted by smartphone OEMs and other mobile device manufacturers.

II. Applications

We believe OLED technology will be applicable to virtually all of today's displays. Due to manufacturing constraints, today's OLED displays are best suited for devices with smaller sized displays such as smartphones, but once this hurdle is overcome, OLEDs present numerous advantages and few inconveniences.

In addition to the typical displays we think of today, such as smartphone, tablet, and television displays, new applications for the technology may arise. For example, the transparent nature of the organic molecules makes them well suited for embedded displays in automotive windshields or windows.

Lighting is another important market for OLED. Energy efficiency is a hot topic today with energy needs rising and preservation a growing concern. The Department of Energy estimates that lighting accounts for 20% of all

electricity usage in the US. Incandescent bulbs only have about 5% efficiency, and fluorescent and while more efficient, compact fluorescent lights are environmentally unfriendly due to their use of mercury. LEDs are not ideal for lighting requirements as their light is point focused, and produces significant amounts of heat. OLEDs on the other hand are a safe and diffuse light source.

OLED devices product solid-state lighting, meaning they rely on the direct conversion of electricity to visible white light using semiconductor materials. By avoiding the heat and plasma-producing processes of incandescent bulbs and fluorescent lamps, solid-state lighting products can have substantially higher energy conversion efficiencies, which in theory could approach 100%.

There are currently two types of solid-state lighting: organic and inorganic LEDs. Inorganic LEDs are very small and extremely bright. They are commonly used in specialty applications such as traffic lights, stadium displays, and aircraft lighting. However, the high operating temperatures and intense brightness of LEDs may make them less suitable for general illumination and diffuse lighting applications.

OLEDs, on the other hand, are larger in size and are a diffuse light source than can be viewed directly. OLEDs can be built on any suitable surface, including glass, plastic or metal foil, but we have yet to see how cost-effective they will be to manufacture in high volume. OLED lights provide two main advantages over incandescent bulbs and fluorescent lamps: greater efficiency and a thin form factor.

III. What are the benefits of OLED?

Energy Efficiency - An important advantage of OLED displays over today's LCD and plasma displays is reduced power consumption. The organic molecules emit light, thus they do not require a back light. LCDs and LED TVs require back lighting while the organic molecules in OLEDs emit light. Smartphone sized OLED displays are estimated to consume 15% less power than their LCD equivalents and could double to 30% with the implementation of a second phosphorescent color. This energy efficiency makes OLED displays a preferred choice for rechargeable hand-held devices, where battery life can be a limiting factor in component selection by CE device manufacturers.

Size - OLED displays do not require a back light, and as such they can be much thinner than traditional liquid crystal displays. Furthermore, the front panel can be made of plastic, rather than glass which is required for plasma televisions, resulting in a much lighter display than what is currently available on the market.

Flexible Substrates - The organic layers of an OLED device are thinner and lighter than the crystalline layers in an LED or LCD, and thinner and lighter than the plasma screen glass, which allows for the creation of flexible OLED devices. Prototypes of flexible OLED technology were unveiled at CES (Consumer Electronics Show) 2011, and the US government is currently funding research on flexible OLEDs.

Wider Viewing Angles - OLED displays emit light, rather than selectively block it, so the light can be seen from extreme angles, up to 180 degrees as advertised by Samsung. However, in-plane switching technology, currently used by Apple's iPhone 4, offers similar viewing angles with an LCD display. Plasma TV's also have wider viewing angles since they are light emissive as well, but traditional LCDs do not.

Transparency - The organic molecules in OLED devices are inherently transparent, and by using a transparent cathode, as opposed to the typical reflective metal cathode, the display itself becomes transparent. Currently, demand for transparent OLED devices is limited to the US military, but we believe the automotive industry could become a new market, for example for OLED displays built in to rear-view mirrors.

IV. What are the disadvantages of OLED?

Longevity - The first is the longevity of phosphorescent emitters. Currently, blue phosphorescent emitters have the shortest lifespan of the three colors, and OLED displays are essentially limited by their weakest link. However, since the technology is relatively new and is under constant development, longevity could be improved, and current longevity is still only an estimate. Furthermore, fluorescent emitters can be substituted for phosphorescent emitters, though they are not as energy efficient and PANL does not get paid for these.

Sunlight - A known issue of AMOLED smartphone displays is poor readability in direct sunlight. However, advances in the technology have greatly improved this issue by reducing light reflectivity.

Screen Burn-In - Another possible shortcoming of OLED that remains to be seen is screen burn-in, also known is image retention. Users of earlier versions of AMOLED smartphone displays have reported screen burn-in, but newer phones have addressed the issue and we have yet to see if the problem returns. The scenario is similar to plasma technology, where early adopters of plasma TVs were plagued by static images being etched into the display before manufacturers combated this problem with techniques such as motion adaptive anti burn in technology, which displaces the image just enough to cause color changes in the pixels without being noticed by the human eye.

V. Display Technologies

OLED manufacturing has been ramping recently, most notably with Samsung's investment in a Gen 5.5 (generations refer to the size of the substrates, which are then sliced into displays) fabrication facility. Near term, small-area displays expected to be widely adopted by smartphones. Only a handful of OLED TVs are available today and priced at several thousand dollars for screens smaller than 20", they represent more of a proof of concept than marketable product. The biggest hurdle to overcome in establishing OLED as the de facto display standard is on the supply side. We believe OLED offers superior performance in many aspects: power consumption, resolution, weight, thickness, viewing angle, and heat emission. However, the manufacturing process will require additional development before OLEDs can be mass produced at a competitive cost. Early adopters may be willing to pay a premium, but in order for OLED to become the new display standard, it will need to be widely available and price competitive with the current technologies.

The production difficulty lies in how to quickly deposit the organic material over a large surface. Current production is similar to early LCD production. In 2001, researchers unveiled a breakthrough in LCD production, but the same concepts cannot be applied to OLED due to there being three layers rather than a single layer as with liquid crystal.

Inorganic LEDs, OLEDs, and Liquid Crystal Displays

Inorganic LEDs can be used for display purposes, primarily on billboards and stadium displays. Each bulb constitutes a pixel, and pure LED displays remain a specialty market. Recently, TV manufacturers have advertised LED TVs, which are essentially LCD screens that are back lit by LEDs rather than the standard cold-cathode fluorescent lights. They present a number of the same advantages OLED screens have over traditional LCDs. The first, and arguably the biggest selling point to quality enthusiasts, is the improved contrast ratios versus LCDs. This means that the gap between the brightest whites and darkest blacks is larger, though marketers will focus more on the fact that LED TVs can display much darker levels of black. LCD screens display the color black by blocking the light passing through the panel, but the back light cannot be switched off for portions of the screen. LED TV’s, however, can locally dim parts of the screen and display truer blacks. LED TVs consume less power than regular LCDs, and are both thinner and lighter.

OLEDs are fundamentally different than LED TVs and LCDs in that they are not back lit. Instead, the organic molecules give off light when current passes through them. As a result, it is much easier to display deep black levels by limiting conductivity to the organic molecules.

In terms of color accuracy, each OLED pixel contains the red, green, and blue elements (though today only red is phosphorescent, green and blue remain fluorescent) required to create any color on the spectrum. LED TVs and LCDs, in contrast, work by subtracting colors from white light. While manufacturers have finely tuned the process, OLED’s bottom-up color creation is likely more precise.

OLED vs. Plasma

OLEDs operate similarly to plasmas in that neither needs a light source. Plasma screens contain thousands of pixels, each filled with three gas-filled cells (one for each primary color). An electric current is sent to the individual cells, which causes them to emit high-frequency UV rays that stimulate the cells' phosphors and cause them to glow the desired color. Plasma screens emit light, rather than filter it, so they present the same viewing angle advantages as OLEDs. The primary difference for the consumer is in the size and weight of the displays. OLEDs have a very thin Plexiglas-like layer encasing the organic films and TFT (thin film transistor), while plasmas panels are essentially glass envelopes encasing the pixels, making them heavier and more susceptible to breaking.

Management Team and Ownership

Figure 9 - PANL Management Overview

		Experience			Education	
Name	**Age**	**Position**	**Company**	**Dates**	**Degree**	**Institution**
Steven V. Abramson	59	President & CEO	Universal Display	2007 - Present	JD	Temple
		President & COO	Universal Display	1996 - 2007	MA	Ohio State
		VP, Gen. Counsel	Roy F. Weston	1992 - 1996	BA	Bucknell
		Gen. Counsel, EVP, GM	InterDigital	1982 - 1991		
Sidney D. Rosenblatt	63	Executive VP & CFO	Universal Display	1995 - Present	JD	Temple
		Owner & President	S. Zitner Company	1990 - 1998	L.L. M.	Temple
		Senior VP, CFO, Treasurer	InterDigital	1982 - 1990	BBA	Temple
Julia J. Brown, Ph.D.	50	Senior VP & CTO	Universal Display	2002 - Present	PhD	USC
		VP of Technology	Universal Display	1998 - 2002	MS	USC
		Research Dept. Manager	Hughes Research Labs	1991 - 1998		
Sherwin I. Seligsohn	75	Founder & Chairman	Universal Display	1995 - Present		
		CEO	Universal Display	1995 - 2007		
		Chairman & CEO	Global Photonic	2006 - Present		
		Chairman Emeritus	InterDigital	1990 - 1991		

Source: PANL filings

Figure 10 - PANL Insider Ownership

	Directors and Executives	**Shares**	**Percent Ownership**
Common Stock	Sherwin I. Seligsohn	674,989	1.5%
	Steven V. Abramson	480,985	1.1%
	Sidney D. Rosenblatt	667,676	1.5%
	Jula J. Brown, Ph.D	258,161	0.6%
	Janice K. Mahon	87,460	0.2%
	Michael G. Hack, Ph.D	38,762	0.1%
	Leonard Becker	35,088	0.1%
	Elizabeth H. Gemmill	184,496	0.4%
	C. Keith Hartley	194,077	0.4%
	Lawrence Lacerte	955,002	2.1%
	Total	3,576,696	7.9%
Series A Preferred	Sherwin I. Seligsohn	200,000	100%

Source: PANL filings

Industry Overview

Flat Panel Displays - Within the flat panel display industry, the most recognizable technologies are CRT, LCD, LED, and Plasma displays, with traditional LCDs currently dominating the market. LED-backlit LCDs

are a newer and more expensive technology, and plasmas present their own disadvantages (weight, burn-in, fragility) which have prevented them from securing a market leadership position. Traditional LCDs can be used in cell phones, tablets, laptop computers, other portable devices, and larger products such as televisions and computer monitors. LCD's primary competitive threat to OLED is its production cost. LCDs were once relatively expensive to produce, but a manufacturing breakthrough led to cost-efficient mass production. OLED technology is still waiting for a similar breakthrough. Flat panel display manufacturers include Samsung, LG, AU Optronics, Toshiba, Sony, and Chimei. The following table summarizes our flat panel display market expectations through 2015.

Figure 11 - Flat Panel Display Industry

(units in mil)	2010A	2011E	2012E	2015E	2010-2015 CAGR
Smartphone	300	470	630	1100	30%
Tablet	18	70	108	294	75%
TV	247	260	275	308	5%

Sources: Avondale estimates, IHS iSuppli, DisplaySearch, Gartner, IDC

Smartphones - Smartphone shipments have accelerated rapidly since 2010 (~100m units 1Q11 vs. ~55m units 1Q10) and surpassed PC shipments for the first time in the Dec. 2010 quarter. While OLED adoption by smartphone OEMs is currently ramping, LCD remains the display standard. Gartner and IDC estimate that in 2015, ~1 billion smartphones will ship (vs. ~300m 2010), representing a CAGR of 25-30%. An estimated 75-90% of smartphones today use LCDs and Apple's iPhone 4 uses an advanced LCD dubbed IPS LCD (in-plane switching liquid crystal display). OLED displays are seen as a way for smartphone OEMs to distinguish themselves from Apple.

Tablets - Gartner estimates the market for tablets will reach ~300m in 2015. Apple is currently sitting atop the tablet hierarchy with its iPad and iPad 2, but Samsung's Galaxy Tab has proven that Android-based tablets are a meaningful threat to Apple, just as Android smartphones recently took the top spot in the mobile operating system space. It is unlikely Apple will use an OLED display in its next iPad unless additional display manufacturers enter the OLED market since Apple looks for multiple suppliers of its product components. Other tablet manufacturers include Samsung, HP, and RIM.

TVs - The television market is currently dominated by LCD technology. Plasma technology, still on the market and similar to OLED in that it emits light, has issues with screen burn-in and a heavy layer of glass encapsulating the plasma. The LCD TV market is expected to continue growing, albeit at a decelerating pace, particularly in Asia where a rising middle class with disposable income is expected to drive TV growth. Competitors in the flat panel TV market (LCD, LED LCD, and Plasma) include, in order of largest to smallest market share, Samsung, Sony, LG, Panasonic, and Sharp.

Lighting - According to the Department of Energy (DoE), lighting applications consume approximately 20% of all electricity generated in the US. As a result, the DoE has awarded numerous grants to companies developing high efficiency lighting products to replace incandescent bulbs. Currently, compact fluorescent lamps (CFL) are the most commonly available energy efficient light bulbs, though LEDs, which offer additional energy savings and do not use poisonous mercury, are also competing for the energy efficient bulb market. Commercial OLED lighting is not yet available, but several companies are offering OLED lighting panels as 'sample panels' for premium light fixtures or as design kits for lighting professionals. OLED panels are expected to offer slight energy efficiency gains over inorganic LEDs, but the main benefit over LEDs will be the form factor and diffuse lighting source. Important manufacturers include Philips Lighting, Acuity Brands, Hubbell, and OSRAM SYLVANIA (a subsidiary of Siemens).

Recent Results and Financial Forecasts

	1Q11	2Q11E		2011E	
PANL	Results	Avondale	Consensus	Avondale	Consensus
Revenues ($M)	9.6	10.3	9.9	48.2	48.1
Non-GAAP EPS ($)	(0.04)	(0.01)	(0.01)	0.10	0.19

Note: 2011E consensus estimates range between (0.21) - 0.53.

Company Description

Founded in 1985, New Jersey based PANL holds key patents on OLED (organic light emitting diode) technology, specifically PHOLED (phosphorescent OLED). PANL is involved in the licensing and development of PHOLED. Samsung and LG are currently PANL's largest customers, collectively accounting for 58% of total 2010 revenues.. Developmental revenues primarily relate to R&D for customers and small government contracts with agencies such as the Department of Energy and Department of Defense. PANL has about 90 employees including 3 patent lawyers and ~60 scientists involved in R&D.

PANL licenses its technology to display manufacturers for approximately $0.22 per device (assuming smartphone sized displays with a $25 ASP and one PANL color), split between chemical materials PANL prices at ~$500/gram and a royalty estimated at $0.45 (per color) of the display ASP. OLED displays are already available in many smartphones, most notably in Samsung's Galaxy line, and PANL is currently negotiating long term agreements with display manufacturers to replace the current 3-6 month contracts.

Investment Thesis

- **OLED Market Reaching Inflection Point -** Smartphones account for the majority of OLED usage today and are expected to drive a $4-5 billion OLED display market in 2012. Samsung's new $2.2 billion fabrication facility, the largest OLED plant to date, came online in May and we believe Samsung could spend up to $3 billion on OLEDs over the next two years. With Samsung's additional capacity and LG's smaller facility operational, we expect increased implementation of OLEDs in their respective products and adoption by other smartphone OEMs. We estimate a 1% increase in OLED adoption by smartphone OEMS yields up to $0.05 incremental EPS in 2012, and we estimate Samsung's new facility could generate ~$115m in annual revenues for PANL assuming full capacity.
- **Cashing In On The Patent Portfolio -** PANL owns key PHOLED patents, of which the most important do not begin expiring until 2017. We estimate PANL currently receives $0.22 in chemical sales and royalties per smartphone (assuming a $25 display ASP). PANL supplies chemical materials for every PHOLED display sold, which it prices at ~$500 per gram, and collects a royalty estimated at 0.45% (per color) of the display ASP . Display manufacturers today only use PANL's phosphorescent red and depend on fluorescent material for green and blue. PANL recently reported 400,000 lifetime hours for its green materials, close to LCD lifetimes (500,000 hours), and we believe display manufacturers could begin using PANL's green material by 2012.
- **An Attractive Business Model -** With its high margin licensing model and solid balance sheet, PANL is strategically positioned to benefit from the OLED inflection point. We estimate gross margins on chemical sales are approximately 90%, and we believe that net margins could be in the 30% range, similar to IP licensor DLB. Following a recent secondary offering, PANL has $325 million on its balance sheet and no debt. If the smartphone, tablet, and TV opportunities materialize, we believe PANL's attractive margins and solid, debt free balance sheet warrant a higher valuation relative to its peer group.

Price Target Justification

Our $40 price target is based on 37x our C12 estimate. We believe this high multiple is appropriate given the OLED market opportunity, PANL's scalable licensing business model, and its solid balance sheet with ~$8 per share in net cash.

Potential Catalysts

- **Long Term Royalty Agreements -** Current arrangements with display manufacturers consist of short term contracts. If PANL can secure more definitive agreements with display manufacturers, particularly Samsung, we believe royalty rates would likely remain at current levels or be negotiated higher, likely providing upside to shares.
- **Phosphorescent Green & Blue -** Currently, PANL only sells chemicals to produce the color red. Display makers use fluorescent OLED materials for the other two primary colors, green and blue. While fluorescent organic molecules are not as energy efficient as their phosphorescent counterparts, they have longer

lifetimes. Green molecules are currently being used by customers in test lines and have not yet been adopted for commercial use. Should customers begin using phosphorescent green molecules, we believe PANL shares would benefit since royalty rates and chemical material revenues could double. The same holds true for the color blue, but significant advances need to be with blue as lifetimes are prohibitively low.

- **New Fabrication Facilities -** The OLED market will be dependent upon capacity expansion to achieve meaningful penetration. LG Display is expected to race towards large-area display manufacturing, securing itself a first-mover advantage in the OLED TV market, and a CapEx announcement from LG could provide a catalyst to shares.
- **Potential M&A Activity -** PANL's business is centered on its IP, and we believe PANL could use cash on its balance sheet to acquire additional IP and strengthen its patent portfolio. For example, InterDigital recently suggest it was exploring a sale of its patent portfolio. A strategic IP acquisition could allow PANL to negotiate greater royalty rates and provide a catalyst to shares.

Risks

- **Patent Invalidation -** PANL's business is contingent upon the validity of its intellectual property rights. Should its patents be ruled invalid, PANL's business would be adversely affected. PANL patents are currently being challenged in Korea, Japan, and Europe, but we have no additional color and expect lengthy legal processes.
- **Technology Risk -** While OLED development has progressed significantly and is already commercially available, new technologies could prove to be more cost-effective or more advanced and could render OLEDs obsolete. Just as liquid crystal displays (LCD) replaced cathode ray tube displays (CRT), next generation display technologies could threaten the OLED market.

Universal Display Corporation
Financial Statements
FYE: Dec

($ millions, except per share amounts)	1Q10	2Q10	3Q10	4Q10	CY10	1Q11	2Q11E	3Q11E	4Q11E	CY11E	CY12E
REVENUE BREAKDOWN (Estimated)											
Smartphones											
Smartphone shipments (units)					296.6	100.8	113.5	113.5	122.2	450.0	630.5
Percent OLED					14.2	17.0	20.0	23.0	26.0	21.5	29
OLED smartphone shipments (units)					42	17.1	22.7	26.1	31.8	97.7	183.8
OLED Smartphone display ASP					$25.00	$25.00	$25.00	$25.00	$25.00	$25.00	$22.50
Organic material per color per display (milligrams)					0.22	0.22	0.22	0.22	0.22	0.22	0.22
Organic material ASP ($/gram)					$500	$500	$500	$500	$500	$500	$475
Organic material per display ($)					$0.11	$0.11	$0.11	$0.11	$0.22	$0.14	$0.21
PHOLED royalty rate per color					0.45%	0.45%	0.45%	0.45%	0.45%	0.45%	0.45%
PHOLED royalty rate per display					0.45%	0.45%	0.45%	0.45%	0.90%	0.56%	0.90%
PHOLED royalty per color per display ($)					$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.10
Smartphone display chemicals						1.9	2.5	2.9	7.1	14.3	38.8
Smartphone display royalties						1.8	1.9	2.5	2.9	9.2	33.0
Tablets											
Tablet shipments (units)					18	14.0	17.4	17.4	20.9	69.8	108.2
Percent OLED					-	-	-	-	-	-	2.25
OLED tablet shipments (units)					-	-	-	-	-	-	2.7
Tablet display ASP					$55.00	$55.00	$55.00	$55.00	$55.00	$55.00	$49.50
Organic material per display (milligrams)					0.56	0.56	0.56	0.56	0.56	0.56	0.56
Organic material per display ($)					$0.28	$0.28	$0.28	$0.28	$0.28	$0.28	$0.27
Tablet display chemicals					-	-	-	-	-	-	0.7
Tablet display royalties					-	-	-	-	-	-	1.2
Total chemical revenues					-	1.9	2.5	2.9	7.1	14.3	39.5
Total royalty revenues					-	1.8	1.9	2.5	2.9	9.2	34.1

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Universal Display Corporation
Financial Statements
FYE: Dec

	1Q10	2Q10	3Q10	4Q10	CY10	1Q11	2Q11E	3Q11E	4Q11E	CY11E	CY12E
INCOME STATEMENT											
Sales											
Chemicals	0.7	0.8	1.6	2.5	5.7	1.9	2.5	2.9	7.1	14.3	39.5
Royalty	0.6	0.6	0.8	1.5	3.5	1.8	1.9	2.5	2.9	9.2	34.1
License	0.3	0.3	0.2	0.3	1.2	0.9	1.0	1.0	1.1	3.9	6.8
Commercialization assistance	0.2	0.2	0.2	0.2	0.8	0.2	0.2	0.2	0.2	0.8	0.9
Commercial revenue	1.8	2.0	2.8	4.5	11.1	4.7	5.6	6.6	11.3	28.2	80.7
Developmental revenue	2.4	6.5	4.2	6.3	19.4	4.9	4.7	4.7	5.7	20.0	22.2
Total revenue	4.2	8.4	7.1	10.8	30.5	9.6	10.3	11.4	16.9	48.2	102.9
Operating Expenses											
Cost of chemicals sold	0.5	1.0	1.3	0.2	3.0	0.1	0.5	0.6	1.1	2.3	5.3
R&D	4.5	4.7	4.8	5.6	19.6	6.6	6.6	6.7	6.7	26.5	27.9
SG&A	2.6	3.6	3.5	3.3	13.0	3.9	3.9	4.0	4.0	15.7	18.9
Patent costs	0.8	0.8	1.2	1.5	4.3	1.6	1.5	1.5	1.5	6.1	6.4
Royalty and license expense	0.1	0.2	0.2	0.4	0.9	0.2	0.22	0.2	0.4	1.0	2.1
Total operating expenses	8.5	10.4	10.9	11.0	40.8	12.3	12.8	13.0	13.6	51.7	60.6
Operating income	(4.2)	(1.9)	(3.9)	(0.2)	(10.2)	(2.7)	(2.4)	(1.6)	3.3	(3.5)	42.3
EBITDA	(2.7)	(0.1)	(2.1)	3.5	(1.4)	(0.8)	(0.3)	0.7	5.7	5.3	52.3
Interest income	0.1	0.1	0.1	0.1	0.3	0.1	0.8	0.8	0.8	2.5	4.4
Interest expense	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loss (gain) on stock warrant liability	(0.7)	2.6	3.4	4.8	10.1	8.9	-	-	-	8.9	-
Income before tax	(3.4)	(4.4)	(7.2)	(5.0)	(20.1)	(11.6)	(1.6)	(0.8)	4.1	(9.9)	46.7
Provision for income tax (benefit)	(0.5)	-	-	0.3	(0.1)	0.3	0.3	0.4	0.5	1.5	5.5
Net income - GAAP	(3.0)	(4.4)	(7.2)	(5.3)	(19.9)	(11.9)	(1.9)	(1.2)	3.6	(11.4)	41.1
Adjustments	(0.7)	2.6	3.4	4.8	10.1	10.5	1.7	1.8	1.9	15.8	8.0
Net income - Non-GAAP	(3.7)	(1.9)	(3.8)	(0.5)	(9.8)	(1.4)	(0.3)	0.6	5.5	4.4	49.1
Shares O/S	37.0	37.4	37.7	38.1	37.6	38.9	45.3	45.4	45.5	43.8	45.8
EPS - GAAP	$ (0.08)	$ (0.12)	$ (0.19)	$ (0.14)	$ (0.53)	$ (0.31)	$ (0.04)	$ (0.03)	$ 0.08	$ (0.30)	$ 0.90
Non-GAAP adjustment	(0.02)	0.07	0.09	0.13	0.27	0.27	0.04	0.04	0.04	0.40	0.18
EPS - Non-GAAP	$ (0.10)	$ (0.05)	$ (0.10)	$ (0.01)	$ (0.26)	$ (0.04)	$ (0.01)	$ 0.01	$ 0.12	$ 0.10	$ 1.07
Percent Composition											
Commercial revenue	43.1	23.1	40.2	41.8	36.4	49.4	54.5	58.2	66.5	58.6	78.4
Development revenue	56.9	76.9	59.8	58.2	63.6	50.6	45.5	41.8	33.5	41.4	21.6
Cost of chemicals sold	10.9	12.0	17.8	2.2	9.7	1.1	5.3	5.1	6.3	4.8	5.2
Chemicals margin	73.7	72.8	71.5	96.7	82.8	97.7	90.0	90.0	90.0	90.0	90.0
R&D	105.2	55.7	68.5	51.9	64.2	68.3	63.7	58.7	39.8	55.0	27.1
SG&A	62.2	42.9	48.9	30.8	42.7	40.3	37.9	35.0	23.6	32.7	18.4
Patent costs	18.4	10.0	16.7	13.6	14.0	16.8	14.5	13.2	8.9	12.7	6.2
Total operating expenses	199.5	122.6	155.0	101.9	133.5	128.6	123.5	114.1	80.6	107.2	58.9
Operating income	(99.5)	(22.6)	(55.0)	(1.9)	(33.5)	(28.6)	(23.5)	(14.1)	19.4	(7.2)	41.1
Tax rate on royalty payments							16.5	16.5	16.5	16.5	16.5
Percent Change Yr/Yr											
Chemicals	6.2	47.7	103.2	258.1	107.2	156.0	199.8	76.6	179.4	150.0	175.3
Royalty	103.4	129.3	101.6	141.1	122.3	217.5	224.2	213.7	94.4	164.4	272.0
License	44.9	34.1	(21.2)	(21.5)	5.4	153.0	200.0	400.0	270.0	236.9	75.0
Commercialization assistance	14.6	14.6	14.6	(0.0)	10.5	10.3	5.0	5.0	5.0	6.3	5.0
Total commercial revenue	33.7	57.5	74.9	138.9	81.9	159.2	188.2	132.9	149.5	153.6	186.0
Research	26.4	36.7	14.5	(7.4)	14.3	70.0	5.0	5.0	5.0	19.7	5.0
Chemicals	266.1	361.8	285.5	280.2	297.8	160.5	1.0	5.0	(25.0)	5.2	15.0
Technology development	(10.5)	1,198.3	(90.3)	(56.9)	20.3	0.3	(80.0)	200.0	500.0	(35.6)	5.0
Total development revenue	65.0	278.2	19.7	112.1	100.8	101.0	(27.6)	12.6	(9.8)	2.9	11.1
Cost of chemicals sold	169.5	219.8	354.0	138.9	243.3	(77.7)	(46.4)	(53.9)	344.0	(22.8)	132.7
R&D	(14.4)	(11.7)	(2.2)	8.9	(5.0)	46.8	40.0	38.0	20.0	35.3	5.0
SG&A	0.7	33.5	30.0	13.5	19.4	46.5	8.0	15.0	20.0	20.7	20.0
Royalty and license expense	44.8	97.3	96.6	218.5	121.6	68.1	28.8	9.2	(3.6)	15.7	108.8
Total operating expenses	(4.0)	11.7	22.4	22.0	13.1	45.7	23.2	18.5	23.9	26.8	17.2

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Universal Display Corporation
Financial Statements
FYE: Dec

	1Q10	2Q10	3Q10	4Q10	CY10	1Q11	2Q11E	3Q11E	4Q11E	CY11E	CY12E
CASH CALCULATIONS											
Beginning cash							324.9	324.8	325.4		330.9
+ Net income							(1.9)	(1.2)	3.6		41.1
+ D&A and options							2.2	2.3	2.4		10.0
+ Equity offerings							-	-	-		-
+ Other							-	-	-		-
Subtotal cash							325.2	325.8	331.4		382.1
- Restricted cash							(162.6)	(162.9)	(165.7)		(191.0)
- CapEx	(0.1)	(0.1)	(0.1)	(0.2)	(0.4)	(0.5)	(0.4)	(0.4)	(0.4)		(1.9)
Subtotal cash							162.2	162.5	165.2		189.1
+ Additional debt							-	-	-		-
- Dividends paid							-	-	-		-
+ Share repurchase							-	-	-		-
- Required debt repayments							-	-	-		-
- Additional debt repayments							-	-	-		-
Subtotal cash							162.2	162.5	165.2		189.1
+ Restricted cash							162.6	162.9	165.7		191.0
Ending cash							324.8	325.4	330.9		380.2
Average cash							324.8	325.1	328.2		355.6
Free cash flow							(0.2)	0.6	5.5		49.3
Interest rate							1.0%	1.0%	1.0%		1.2%
Interest income							0.8	0.8	0.8		4.4
BALANCE SHEET											
Assets											
Current assets											
Cash and equivalents	7.6	11.8	8.2	20.4	20.4	258.1					
Short-term investments	55.5	54.3	56.8	52.8	52.8	66.8					
Accounts receivable	2.4	3.9	4.7	7.2	7.2	6.0					
Other	0.4	0.5	0.6	2.0	2.0	1.7					
Total current assets	65.8	70.4	70.3	82.4	82.4	332.6	-	-	-	-	-
Property & equipment, net	10.6	10.2	9.9	9.7	9.7	9.8					
Acquired technology, net	0.8	0.4	-	-	-	0.4					
Other assets	0.2	0.3	0.3	0.2	0.2	0.3					
Total assets	77.5	81.3	80.5	92.3	92.3	343.2	-	-	-	-	-
Liabilities & SE											
Current liabilities											
Accounts payable	1.6	1.7	1.6	2.2	2.2	2.3					
Accrued expenses	3.5	4.4	5.7	6.9	6.9	5.0					
Deferred license fees	6.2	4.0	4.0	4.0	4.0	-					
Deferred revenue	1.0	0.9	0.3	1.3	1.3	5.1					
Stock warrant liabilities	-	-	9.0	10.7	10.7	13.1					
Total current liabilities	12.3	11.0	20.7	25.0	25.0	25.4	-	-	-	-	-
Deferred license fees	3.3	3.1	2.9	2.8	2.8	-					
Deferred revenue	-	-	-	-	-	3.6					
Stock warrant liability	3.0	5.6	-	-	-	-					
Retirement plan benefit liability	-	5.8	6.0	7.1	7.1	7.3					
Total liabilities	18.6	25.5	29.6	34.9	34.9	36.4	-	-	-	-	-
Preferred stock	0.0	0.0	0.0	0.0	0.0	0.0					
Common stock	0.4	0.4	0.4	0.4	0.4	0.5					
Additional paid-in capital	258.6	265.4	267.6	280.1	280.1	541.1					
Accumulated retained earnings (deficit)	(200.1)	(204.5)	(211.7)	(217.0)	(217.0)	(228.9)					
Accumulated other compr. income	(0.0)	(5.5)	(5.3)	(6.0)	(6.0)	(5.9)					
Total shareholders' equity	58.9	55.8	50.9	57.4	57.4	306.8	-	-	-	-	-
Total liabilities and SE	77.5	81.3	80.5	92.3	92.3	343.2	-	-	-	-	-
BALANCE SHEET ANALYSIS											
Working capital (mil.)	53.5	59.4	49.7	57.4	57.4	307.2					
Current ratio	5.3x	6.4x	3.4x	3.3x	3.3x	13.1x					
Acid-test ratio	5.3x	6.4x	3.4x	3.2x	3.2x	13.0x					
Net cash per share	$1.70	$1.77	$1.72	$1.92	$1.95	$8.35					
Tangible book value/share	$1.59	$1.49	$1.35	$1.51	$1.53	$7.89					
PP&E, net per share	$0.29	$0.27	$0.26	$0.25	$0.26	$0.25					
ROE	-28%	-22%	-24%	-18%	-17%	-6%					
ROA	-21%	-16%	-17%	-12%	-11%	-5%					
DSOs	62	34	55	50	63	63					

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CommTech Comparative

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	Name	Ticker	Rating	7/20/11 Price	% Change YTD	% Change 52-Wk High	FY	Sh. O/S (mil.)	Millions ($) Mkt Cap	Millions ($) EV	EPS 2010A	EPS 2011E	EPS 2012E	EPS % Chg '11/'10	EPS % Chg '12/'11	P/E 2010	P/E 2011	P/E 2012	EV/EBITDA 2010	EV/EBITDA 2011	EV/EBITDA 2012	Mkt to Tgble Book	Mkt to Net Cash	Debt / Cap (%)	Short % of Float	Short Days to cover
SERVICE	AT&T	T	NR	$30.23	3	(5)	Dec	5,910	178,655	244,375	$2.29	$2.37	$2.55	3	8	13.2x	12.8x	11.9x	5.9x	5.7x	5.5x	NM	NM	38	1	2.4
	Verizon	VZ	NR	$37.33	4	(4)	Dec	2,827	105,524	152,719	$2.24	$2.22	$2.61	(1)	18	16.7x	16.8x	14.3x	4.5x	4.3x	4.0x	NM	NM	58	2	3.2
	Sprint	S	NR	$5.19	23	(20)	Dec	2,986	15,497	31,129	($1.16)	($0.63)	($0.46)	NM	NM	NM	NM	NM	5.5x	5.6x	5.6x	NM	NM	57	3	1.5
	VeriSign	VRSN	NR	$33.32	2	(12)	Sep	172	5,723	3,740	$1.03	$1.43	$1.84	39	28	32.3x	23.3x	18.2x	10.1x	9.1x	8.0x	4.8x	2.9x	32	4	2.5
	Akamai	AKAM	NR	$29.36	(38)	(46)	Dec	182	5,357	4,808	$1.43	$1.57	$1.78	10	13	20.5x	18.7x	16.5x	10.3x	9.0x	7.8x	3.5x	9.8x	3	4	1.3
	Amdocs	DOX	NR	$31.56	15	(0)	Sep	193	6,093	4,846	$2.31	$2.32	$2.64	0	14	13.7x	13.6x	12.0x	7.3x	7.6x	7.0x	4.4x	4.9x	6	1	1.5
	Equinix	EQIX	NR	$100.99	24	(4)	Dec	46	4,645	6,064	$0.82	$2.13	$3.04	160	43	123.2x	47.4x	33.2x	11.1x	8.7x	7.5x	5.0x	NM	53	12	8.8
	Neustar	NSR	MO	$26.06	0	(7)	Dec	75	1,966	1,570	$1.71	$1.90	$2.18	11	15	15.2x	13.7x	12.0x	6.7x	5.7x	5.0x	3.8x	5.0x	1	4	9.0
	Convergys	CVG	NR	$13.00	(1)	(13)	Dec	122	1,583	1,812	$1.00	$1.07	$1.18	7	10	13.0x	12.1x	11.0x	7.0x	6.5x	6.0x	5.6x	NM	23	8	12.2
	Synchronoss	SNCR	MO	$31.20	17	(13)	Dec	38	1,198	1,030	$0.70	$0.92	$1.11	31	21	44.6x	33.9x	28.1x	20.4x	15.4x	12.8x	4.9x	7.1x	10	11	10.4
	Knology	KNOL	NR	$14.11	(10)	(13)	Dec	36	513	1,031	$0.54	$1.25	$1.58	132	26	26.1x	11.3x	8.9x	6.5x	5.4x	5.1x	NM	NM	106	4	7.7
	Neutral Tandem	TNDM	MO	$16.55	15	(10)	Dec	35	574	454	$1.31	$1.41	$1.49	8	6	12.6x	11.7x	11.1x	5.4x	4.8x	4.4x	2.8x	4.8x	-	7	6.5
	TNS	TNS	NR	$16.62	(20)	(22)	Dec	26	436	736	$2.37	$2.05	$2.39	(13)	16	7.0x	8.1x	7.0x	5.4x	5.2x	4.9x	NM	NM	72	4	10.9
	Motricity	MOTR	NR	$6.90	(63)	(78)	Dec	40	276	205	$0.39	$0.56	$0.94	43	68	17.7x	12.4x	7.4x	NM	NM	NM	2.8x	3.9x	-	26	6.1
	MEAN				(2)	(18)			23,431	32,466				33	22	27.4x	18.1x	14.7x	8.2x	7.2x	6.4x	4.2x	5.5x	33	6	6.0
	MEDIAN				4	(11)			5,001	4,274				10	15	16.0x	13.7x	12.0x	6.9x	6.1x	5.8x	4.6x	4.9x	27	4	4.9
SOFTWARE	Microsoft	MSFT	NR	$27.06	(3)	(8)	Jun	8,562	231,688	198,180	$2.10	$2.57	$2.75	22	7	12.9x	10.5x	9.8x	7.3x	6.6x	6.1x	6.9x	6.9x	19	1	0.9
	Google	GOOG	NR	$595.35	0	(7)	Dec	319	189,917	158,659	$29.66	$35.41	$41.94	19	18	20.1x	16.8x	14.2x	12.1x	10.1x	8.4x	5.2x	6.1x	5	1	1.3
	Qualcomm	QCOM	NR	$57.30	16	(4)	Sep	1,612	92,368	83,175	$2.46	$3.14	$3.46	28	10	23.3x	18.2x	16.6x	18.9x	13.7x	11.6x	5.7x	10.0x	5	1	1.3
	Adobe	ADBE	NR	$29.16	(5)	(19)	Nov	509	14,834	13,762	$1.93	$2.27	$2.57	18	13	15.1x	12.9x	11.3x	8.7x	8.1x	7.2x	13.6x	13.8x	23	3	2.5
	Nuance	NUAN	MO	$21.27	17	(7)	Sep	315	6,695	6,868	$1.18	$1.53	$1.69	30	10	18.0x	13.9x	12.6x	18.2x	13.2x	10.5x	NM	NM	27	6	6.4
	Dolby	DLB	MO	$43.61	(35)	(38)	Sep	113	4,941	3,831	$2.84	$2.86	$3.30	1	15	15.4x	15.2x	13.2x	7.6x	7.6x	6.5x	3.8x	4.5x	1	5	3.2
	Rovi	ROVI	NR	$56.97	(8)	(18)	Dec	105	5,980	5,947	$2.09	$2.49	$3.11	19	25	27.3x	22.9x	18.3x	20.9x	16.1x	13.1x	58.9x	183.8x	24	7	5.3
	Universal Display	PANL	MO	$30.01	(2)	(53)	Dec	45	1,362	1,038	($0.53)	$0.10	$1.07	NM	970	NM	300.1x	28.0x	NM	195.8x	19.8x	4.4x	4.2x	-	11	4.0
	DTS	DTSI	MO	$37.02	(25)	(27)	Dec	18	661	559	$1.14	$1.53	$2.21	34	44	32.5x	24.2x	16.8x	15.2x	11.4x	8.1x	4.8x	6.5x	-	7	11.7
	SRS Labs	SRSL	NR	$9.27	5	(16)	Dec	15	137	108	$0.19	$0.36	$0.54	87	52	48.8x	26.1x	17.2x	NE	NE	NE	2.7x	4.8x	-	18	21.5
	MEAN				(4)	(20)			54,858	47,213				31	79	23.7x	46.1x	15.8x	13.6x	31.4x	10.2x	11.8x	26.7x	10	6	5.8
	MEDIAN				(3)	(17)			6,337	6,408				25	18	20.1x	17.5x	15.4x	13.7x	11.4x	8.4x	5.2x	6.5x	5	5	3.6
PERIPHERAL	Apple	AAPL	NR	$386.90	20	(2)	Sep	916	354,389	328,769	$15.15	$25.17	$29.55	66	17	25.5x	15.4x	13.1x	16.8x	10.0x	8.2x	7.6x	13.8x	-	1	0.8
	Cisco	CSCO	NR	$15.82	(22)	(39)	Jul	5,577	88,228	63,651	$1.61	$1.60	$1.71	(0)	7	9.8x	9.9x	9.3x	5.0x	5.1x	4.8x	3.6x	3.6x	25	1	0.8
	Hewlett Packard	HPQ	NR	$35.28	(16)	(29)	Oct	2,204	77,757	83,080	$4.58	$5.02	$5.37	10	7	7.7x	7.0x	6.6x	4.5x	4.4x	4.3x	NM	NM	33	1	1.0
	Nokia	NOK	NR	$5.79	(44)	(51)	Dec	3,709	21,475	14,918	$0.81	$0.28	$0.44	(66)	58	7.1x	21.0x	13.2x	2.8x	4.6x	3.8x	2.8x	3.3x	30	3	3.0
	Sony (ADR)	SNE	NR	$26.72	(25)	(28)	Mar	1,004	26,815	21,903	($3.19)	$1.17	$2.06	NM	76	NM	22.9x	13.0x	3.4x	3.2x	2.5x	1.1x	5.5x	27	0	4.0
	Research in Motion	RIMM	NR	$26.64	(54)	(62)	Feb	522	13,900	12,368	$6.34	$5.23	$5.37	(18)	3	4.2x	5.1x	5.0x	2.3x	2.7x	2.5x	2.1x	9.1x	-	6	1.5
	Motorola Mobility	MMI	NR	$22.41	(23)	(39)	Dec	294	6,589	3,389	($0.28)	$0.78	$1.58	NM	104	NM	28.9x	14.2x	14.1x	6.6x	4.1x	NM	2.1x	-	8	6.9
	Garmin	GRMN	MP	$32.00	3	(12)	Dec	193	6,186	3,904	$2.95	$2.58	$2.64	(13)	2	10.8x	12.4x	12.1x	5.1x	6.0x	5.9x	2.1x	2.7x	-	19	13.0
	Trimble Navigation	TRMB	NR	$37.66	(6)	(28)	Dec	120	4,518	4,460	$1.61	$1.97	$2.36	22	20	23.4x	19.1x	16.0x	21.5x	16.4x	13.1x	15.6x	77.9x	10	1	0.9
	Polycom	PLCM	NR	$30.94	59	(10)	Dec	85	2,641	2,177	$0.75	$1.09	$1.39	46	28	41.3x	28.3x	22.2x	11.7x	7.7x	6.1x	4.5x	5.7x	-	6	1.9
	Logitech	LOGI	MP	$10.41	(44)	(55)	Mar	177	1,847	1,386	$0.93	$0.87	$1.02	(6)	17	11.2x	12.0x	10.2x	5.1x	5.3x	4.6x	3.4x	4.0x	-	10	7.9
	Plantronics	PLT	MO	$36.22	(3)	(8)	Mar	49	1,792	1,322	$2.36	$2.53	$2.81	7	11	15.3x	14.3x	12.9x	7.9x	7.5x	7.0x	2.9x	3.8x	-	9	9.1
	NetGear	NTGR	NR	$39.17	16	(14)	Dec	36	1,404	1,160	$1.74	$2.52	$2.85	45	13	22.5x	15.6x	13.7x	11.3x	8.3x	7.4x	3.6x	5.8x	-	4	2.4
	Synaptics	SYNA	NR	$24.15	(18)	(28)	Jun	35	834	606	$2.26	$2.49	$2.47	10	(1)	10.7x	9.7x	9.8x	5.8x	5.4x	5.6x	2.6x	3.7x	1	26	18.4
	Universal Electronics	UEIC	MP	$24.20	(15)	(20)	Dec	16	375	358	$1.51	$2.36	$2.56	56	8	16.0x	10.3x	9.5x	9.8x	5.8x	5.3x	2.5x	21.7x	11	7	18.5
	Sierra Wireless	SWIR	MP	$11.72	(21)	(29)	Dec	31	366	283	$0.64	$0.40	$0.76	(38)	90	18.3x	29.3x	15.4x	8.3x	11.9x	10.6x	2.6x	4.4x	9	3	6.2
	Novatel Wireless	NVTL	MP	$5.34	(44)	(54)	Dec	33	174	115	($0.39)	($0.25)	$0.40	NM	NM	NM	NM	13.4x	NM	10.2x	3.2x	1.7x	2.9x	-	17	8.6
	KVH Industries	KVHI	MO	$11.49	(4)	(31)	Dec	15	172	141	$0.49	$0.37	$0.81	(24)	119	23.4x	31.1x	14.2x	12.1x	11.9x	6.0x	1.9x	5.4x	4	7	10.2
	MEAN				(13)	(30)			33,859	30,222				6	34	16.5x	17.2x	12.4x	8.7x	7.4x	5.8x	3.8x	10.3x	8	7	6.4
	MEDIAN				(17)	(28)			3,580	2,783				7	17	15.3x	15.4x	13.0x	7.9x	6.3x	5.5x	2.7x	4.4x	0	6	5.1
	NASDAQ 100	NDX		2388	8	(1)					$142.27	$164.26	$186.54	15	14	14.5x	16.8x	14.5x								
	S&P 500	SP50		1326	5	(3)					$83.90	$98.58	$112.75	17	14	13.4x	15.8x	13.4x								
	DJIA	DJII		12572	9	(3)					$859.43	$979.05	$1,104.31	14	13	12.8x	14.6x	12.8x								

Notes:

Sources: Avondale Partners, Company reports, Bloomberg, Dow Jones, & Thomson. All estimates are calendar year. Sorted by market capitalization. Abbreviations: NA - Not available/applicable; NE - No estimate; NM - Not meaningful. Ratings: MO - Market Outperform; MP - Market Perform; MU - Market Underperform; NR - Not Rated.

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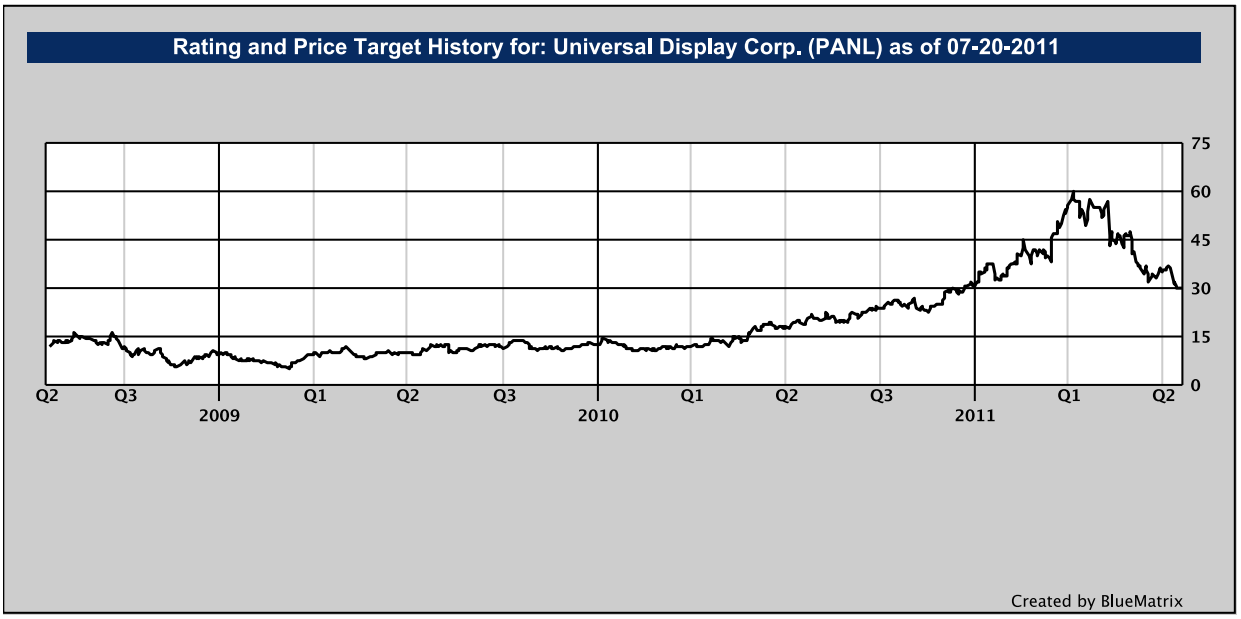
Price Target Valuation Method and Risk Factors: The 12 month price target is based on the analyst's assessment of future earnings and cash flow, comparable company valuations, and growth prospects. Risks to the target include broader market and macroeconomic fluctuations, as well as unforeseen changes in the company's fundamentals, business trends, competition, and/or unexpected management changes. Additional disclosures are available by calling 866-699-3531.

Rating Definitions

MO: Expected price gains of at least 5-10% greater than the market over the next 6-18 mos.
MP: Expected price gains similar to the market over the next 6-18 mos.
MU: Expected price gains of at least 5% less than the market over the next 6-18 mos.



			Investment Banking Serv./Past 12 Mos.	
Rating	Count	Percent	Count	Percent
BUY [MO]	107	57.20	3	2.80
HOLD [MP]	77	41.20	0	0.00
SELL [MU]	3	1.60	0	0.00

Other Disclosures

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