

White Paper:

Ultimate Guide to Leveraging High-Brightness Displays for Outdoor Communications



Taking the Message Outdoors

Digital signage serves a wide range of uses, from advertising exciting new products to informing the public of critical information. Today, digital signage is available for more uses than ever before.

The many barriers that limited how digital screens could be used outdoors and in direct sunlight have all come down, making it possible now to get high impact, dynamic messaging in front of consumers in almost any situation.

Rain, snow, heat and cold long conspired to make putting screens out in the elements – in a drive-thru lane or on a transit shelter wall – a costly, complicated and temperamental proposition. But no more.

Putting digital signage in shop and bank branch windows was usually a wasted effort, because direct sunlight overpowered the light from the displays. That's also changed.

Above all, LCD and LED display manufacturers and the specialty firms that do outdoor work are taking advantage of years of insights and experience, engineering advances and dropping costs to make the process of putting screens out in the elements, or in sun-bathed windows, entirely possible and logical.

“I think we’ll see the day, pretty quickly, where even Mom and Pop stores are replacing the printed posters with digital posters in their windows, because the prices and ease of doing it will reach that point,” says Nick Lee, Experimental Engineer with Yesco, a Las Vegas-based specialty display company that designs and builds screens to run and last outdoors.



Displays that Deliver, Rain or Shine

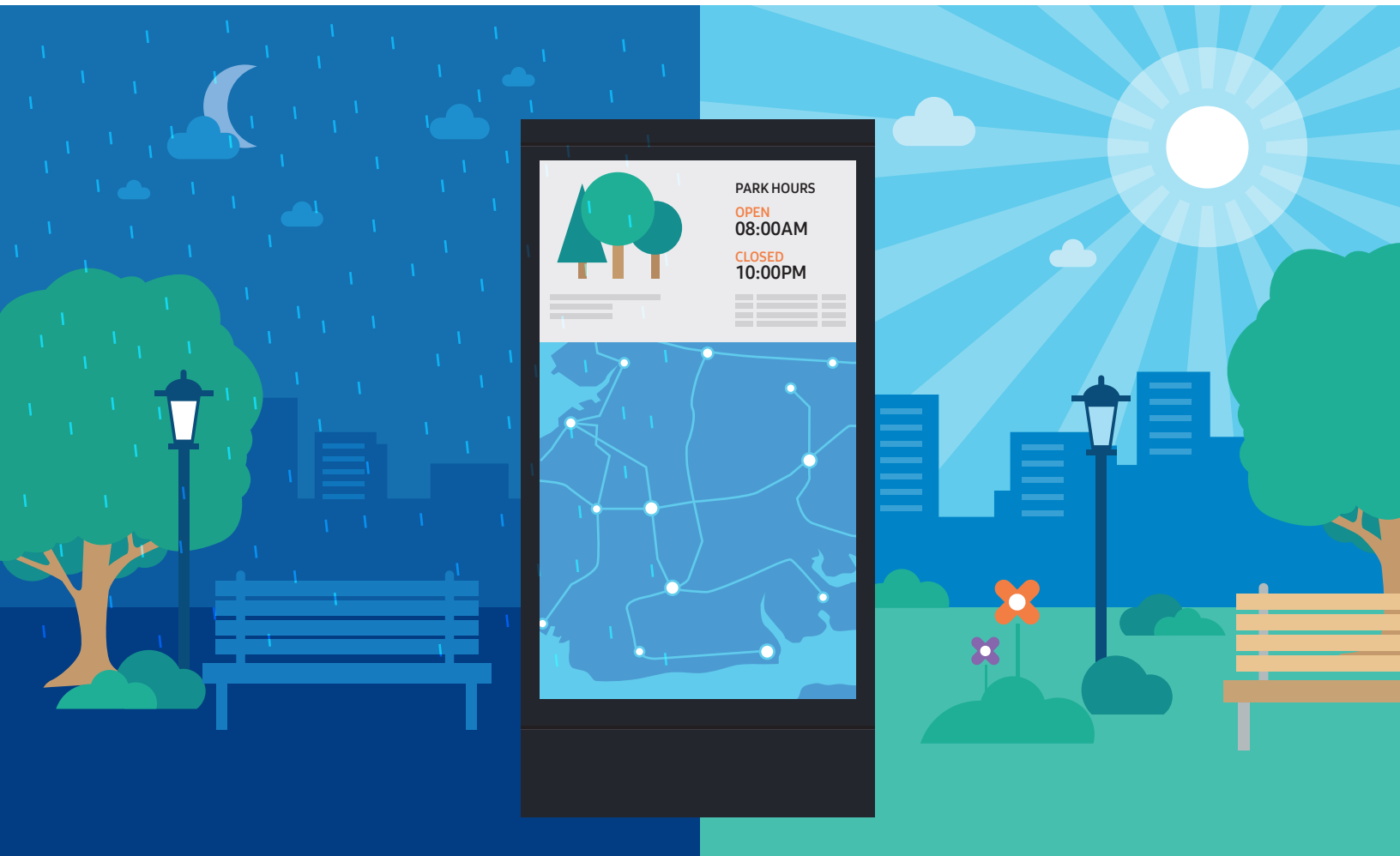
It's possible now to have mouth-watering images and videos showing on pre-sell screens in the drive-thru lanes of snow-battered New England, interactive directories running on the sun-scorched sidewalks of Tucson, and stacked digital mannequins in the department store windows of big cities - visible, rich and attractive even on the sunniest afternoons.

That's a big change, even from just a few years ago.

The early days of outdoor and outdoor-facing digital signage displays were characterized by finding the right components and reliable suppliers, and then conquering the enormous engineering challenges of keeping displays running no matter what Mother Nature threw at them.

Many early adopters – media companies and restaurant operators – saw screens and systems fail because the components and engineering put together by inexperienced suppliers weren't up to the task of working in heat and blazing sun, high humidity or wild temperature swings from deep freezes to heat waves.

These days, reliability is largely assumed from major suppliers and solution providers. The specialists in outdoor LCD displays solutions have their R&D efforts more focused now on adding and integrating new functionality that meets the expectations of the smartphone generation.



Displays Specialized for Environmental Applications



Outdoor digital signage products break down in two ways – displays that face outside, and those specifically engineered to live and work outside.

Semi-outdoor displays are used indoors, but in locations exposed to direct sunlight. They are all about nits – the measurement of brightness commonly used in the display panel business, representing candelas per square meter. With the exception of heavily shaded locations, regular commercial display panels built for indoor use will not be effective in communicating messages during daylight hours. Direct sunlight and glare will wash out and overpower the visuals.

Where 300-500 nits is typical for indoor display panels, outdoor and high brightness panels can generate more than 2,500 nits, and have both the brightness and color contrast properties to cut through even direct sunlight. A commonly used term for that is daylight readable. You'll see them in

storefront windows, individually or stacked in totems or grouped to make video walls.

Outdoor displays may look a lot like their semi-outdoor brethren but are very different products. While they have similar brightness capabilities, outdoor displays reflect years of engineering designed to make running an LCD in harsh environments as crisp and reliable as running an LCD on the reception wall of a law office.

Outdoor displays are designed to work flawlessly, for years, despite extreme temperature changes, direct sunlight, precipitation of all types, dust, fumes, and unpredictable events such as power spikes.

“With semi-outdoor displays,” says Lee, “you’re really just worried about brightness. With outdoor, you’re engineering custom environments for these displays to operate in.”

Conquering the challenges



Display specialists focused on providing solutions for companies that wanted their messages outdoors were challenged by a variety of issues during the early years of a still-emerging specialty.



The biggest obstacle was heat – from inside and from the sun. Direct sunlight and its amplified heat could alter the properties of LCD crystals – the display layer of screens – and discolor or cause black blotches. Inside, the challenge was even greater, as heat build-up also affected the state of the LCD layer and shortened the operating lifespans of the electronics.



Specialists resorted to tearing apart LCD panels and re-engineering them with different lighting and electronics to amplify the brightness and better tolerate the heat. In most cases, notably those where high temperatures were an issue, they built air conditioned, sealed enclosures designed to move air through and keep the electronics inside their heat tolerance ratings. They were, effectively, their own micro-environments.



All that engineering was reflected in the final cost to customers – meaning most outdoor installations were done as tests and trials, or only at signature or high-volume locations of retail and media clients.

Digital signage optimized for outdoor lighting and daylight applications.

Semi-Outdoor

Semi-Outdoor displays are designed for usage within buildings but facing the outdoors, with corresponding brightness and contrast.



Outdoor

Outdoor digital signage modules live outside, and need to be visible in a wide variety of lighting and weather conditions while resisting the elements and potential tampering.



LED Backlight Changed Everything

The first — and many following — generations of LCD display panels were illuminated by fluorescent lighting tubes — skinny variations on the fluorescent lighting used for decades in everything from workplaces to backlit advertising posters. They had limited brightness capabilities, generated a lot of heat and were not particularly energy efficient.

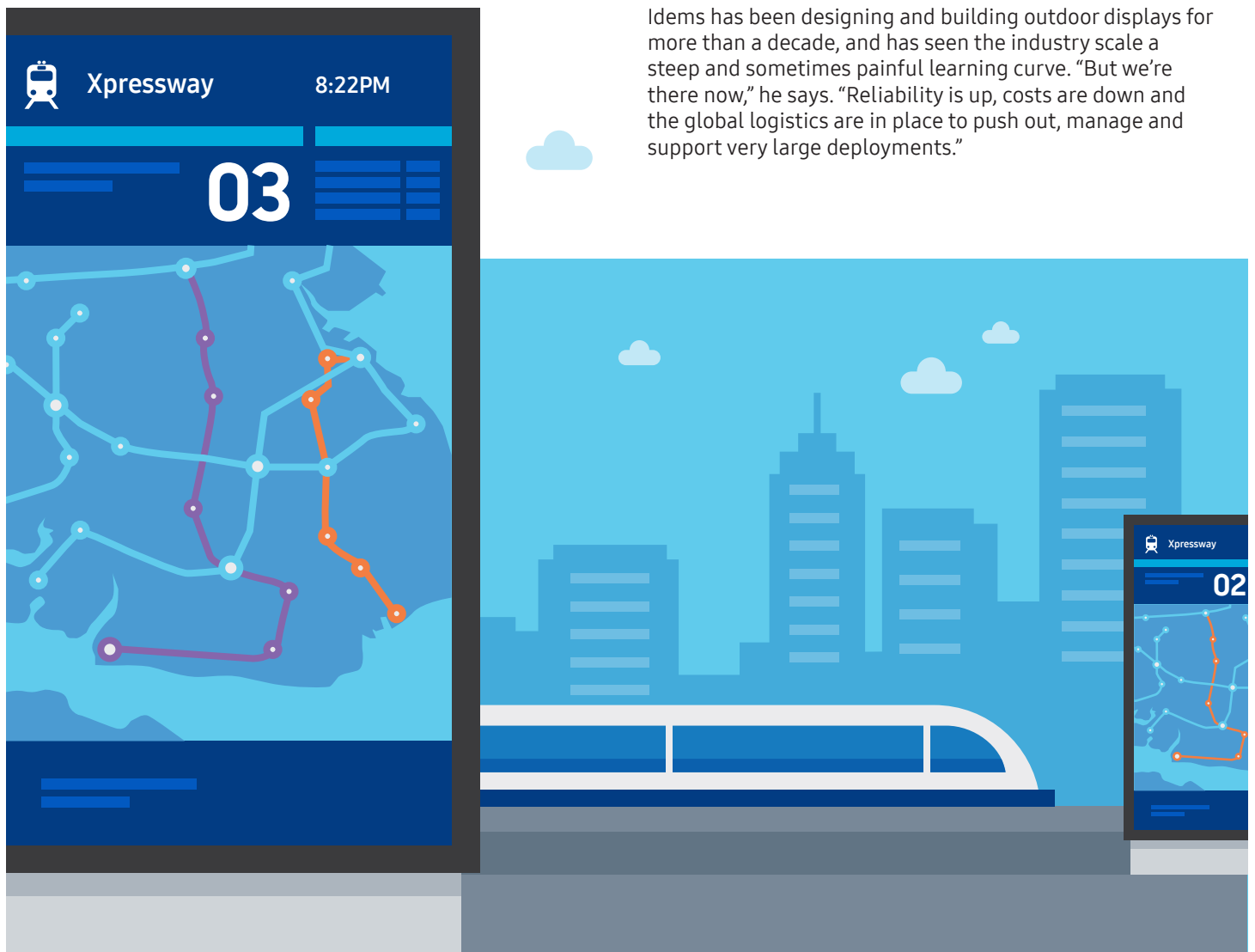
But in the past decade, the commercial display industry (as has happened with TVs) has transitioned to back-lighting using light emitting diodes (LEDs). That has changed everything for outdoor digital signage. Far less heat — even with super-bright LEDs — has

meant that displays that previously needed intense, highly customized heating and cooling designs, with air conditioning and backup systems, could now be cooled with lower cost fan solutions. Air flows and heat dissipates to keep the electronics in their acceptable operating ranges.

These innovations stripped out components, reduced capital and operating costs, and greatly extended the expected operating lives of units being deployed around the world.

“Reliability has increased dramatically,” says Ralph Idems, COO of Vertigo Digital Displays in Toronto, Canada.

Idems has been designing and building outdoor displays for more than a decade, and has seen the industry scale a steep and sometimes painful learning curve. “But we’re there now,” he says. “Reliability is up, costs are down and the global logistics are in place to push out, manage and support very large deployments.”

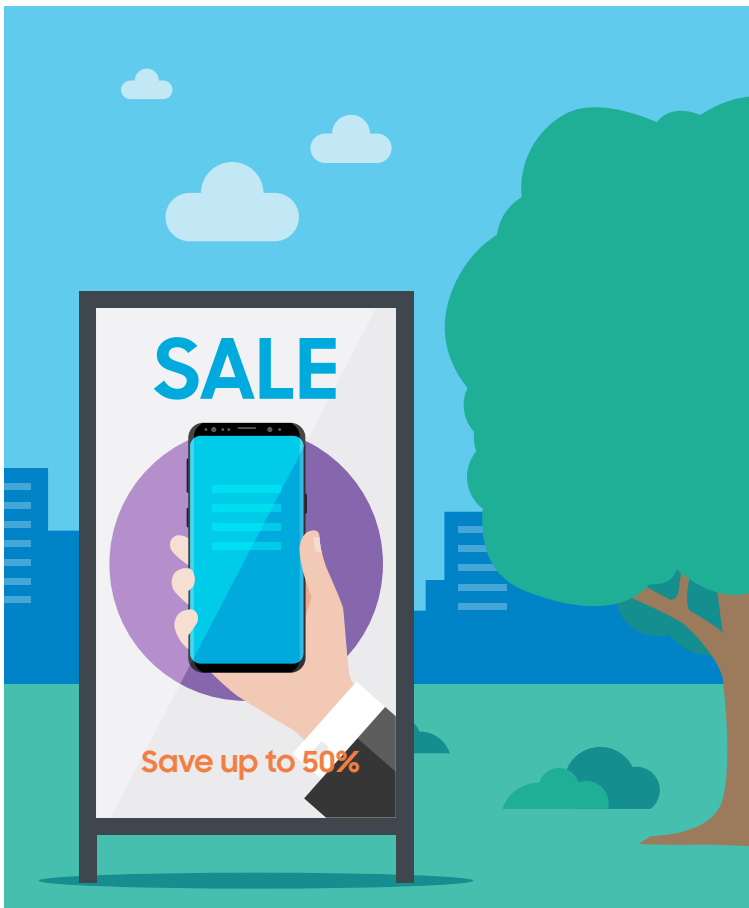


Custom Signage Solutions for Special Applications

Specialty display design engineers don't just have to think about protecting panels against the elements; they also have to factor in the risk from nefarious elements of the general public.

Just like subway cars, building walls and mailboxes, digital signage display enclosures are subject to abuse from vandals and graffiti taggers.

Specialty glass overlays are used to protect the fragile LCD layer of displays from being damaged by intent or accident. Transparent anti-vandal films provide another protective layer across the surface of enclosure glass, limiting scratching and making it possible to simply peel off and replace the film on-site in the event of it being spray-painted or damaged.



Key display considerations

Outdoor display technology is no different from most technologies – in that there's always a cheaper option somewhere. But it is one of those cases where the old saying about "getting what you pay for" is fully in play.

Here's what to think about when researching and sourcing outdoor and high brightness displays:



Is it truly bright enough to be daylight readable?



Will people wearing sunglasses see the visuals properly, because the displays handle polarization properly?



What is the pedigree – the experience, history and size – of the supplier?



How does the manufacturer or supplier validate the display's engineering? Do they have labs where things like thermal temperatures and sun-loading are tested?



What's the warranty period and the life-cycle of the product?



Are there spare part depots in the region, or at minimum, in the country?



What's in place for vandalism protection, and for the security of the screens and particularly the media players inside enclosures?

Putting it Together for Outdoor Success

Putting a digital screen out in the elements is a major engineering challenge because of the obstacles that need to be cleared. It has always been much more than finding an LCD display bright enough to cut through sunlight. They've needed to live in their own custom-designed, weather-protected and climate-controlled environments.

It's been specialized work best left to companies that have years of experience, extensive R&D capabilities and a broad set of skills. That's also, invariably, meant costs for outdoor displays have been many multiples of their indoor cousins.

The handful of companies that have specialized in outdoor displays have tried to keep costs down by developing standardized designs that could work for many projects. Unique designs that introduce new engineering, testing and tooling of parts can easily double costs.

Companies have found themselves working on outdoor advertising displays for transit shelters that had to operate in cold, damp Helsinki, and then do a different design for the super-bright, oven-like conditions of Phoenix.

49" Digital Indoor Signage Display

300-500 nits



46" Digital Outdoor Signage Display

2500 nits



The Major Elements of an Outdoor Deployment



High brightness commercial display, 2000 nits or brighter.



Power for all components, including laying conduits where needed.



Media player and management software. The media player is typically a separate device, but new "smart" displays may ship with embedded media Players.



Rugged metal enclosure that houses all equipment including the power supply, mounts, protective glass, anti-vandal film, and fans for active cooling.



Connectivity, using wired LAN, or, where feasible, Wi-Fi.



Increasingly, custom enclosures are adding peripheral devices like cameras, touch and motion sensor capabilities, Bluetooth beacons or NFC.

Why Go Outdoor: Benefits of Digital-Out-of-Home

Outdoor digital displays really had their start with the billboard advertising industry, which has rapidly converted much of its stock over to digital. We're now seeing the conversion of print to digital on increasingly smaller display "faces" – not only in advertising, but in everything from retail marketing to information stations and directories at malls, campuses and large facilities.

The reasons and impacts are clear:

- Digital displays – with static or moving content – get noticed, and their messages recalled;
- Messages can be changed remotely, on demand, and scheduled by anything from time of day or week, to location;
- Digital introduces opportunities for engagement, through interactive touch or even gesture, and creates bridges to other technologies like smart-phones, and payment and ordering systems;

- Compliance rates – a measure of the percentage of marketing material that appears where it should, when it should – skyrockets when campaigns are planned and executed by a central office, with no need to rely on local managers getting posters up and down on time and as directed;
- Digital introduces dynamics – leveraging Internet of Things data from databases, mobile devices and sensors to present content and messaging based on conditions. In a drive-thru, for example, smart systems could enable a pre-sell display to dynamically suggest adding a pastry when a customer orders a coffee.

Idems says much of the outdoor activity to date has been with media companies converting posters to displays, but he sees a huge wave coming of Quick Service Restaurant operators.

"They're going to convert because they've seen how converting menus inside their restaurants to digital paid off in sales lift on high margin items," says Idems, "and they expect the same will happen in the drive-thru lanes."



Outdoor Displays for Easy Integration

Understanding, from experience and advice, the many challenges of outdoor displays has limited the number of companies that have chosen to focus on this specialized integration work. Samsung's OMD-W Series of high-brightness window displays share many of the characteristics of conventional indoor displays, but are

brighter (2500 nits), sunlight readable and designed to withstand heat from the sun.

They have finished enclosures that can stand alone or be grouped or stacked for video walls, and come in a range of sizes: 46, 55 and 75 inches.



How Samsung Is Changing the Outdoor Game

New, game-changing technology developed by Samsung is opening up outdoor displays to a much broader range of integrators. Samsung's OHF Full Outdoor Series displays have all the engineering and design needed for ultra-bright, high-reliability, high durability displays built into completed, ready to install and use packages.

Shari Sentlowitz, Senior Product Launch Manager, explained that these solutions give customers the easy-to-use solutions that help them implement digital signage with minimal cost and worry.

"These signage modules are designed in such a way that they support a wide variety of firms and levels of expertise, providing an easy to use all-in-one solution that's easily deployed and managed."

It's a huge business opportunity for small to medium businesses. Futuresource suggested in 2014 that just 1 percent of the potential market for outdoor displays had so far been tapped; they pegged the potential market for them at 7.2 million units globally.

Samsung's OHF Series Full Outdoor displays come in 46", 55" 75" and 85". The Samsung OHF Series outdoor signage solution is a completely integrated, self-contained ultra-slim display with an embedded power box, housed in an impact-resistant enclosure and thermally protected by a patent-pending steady cooling system.

All of Samsung's outdoor-focused displays ship with the Smart Signage Platform (SSP), an embedded system-on-chip processor.¹

That means media can be played out on the screens without the need for a separate PC or networked media player. However, separate media player inputs are also designed for customers who choose to use them.

The displays also incorporate circular polarizing technology that makes them easily viewable, even with polarized sunglasses.

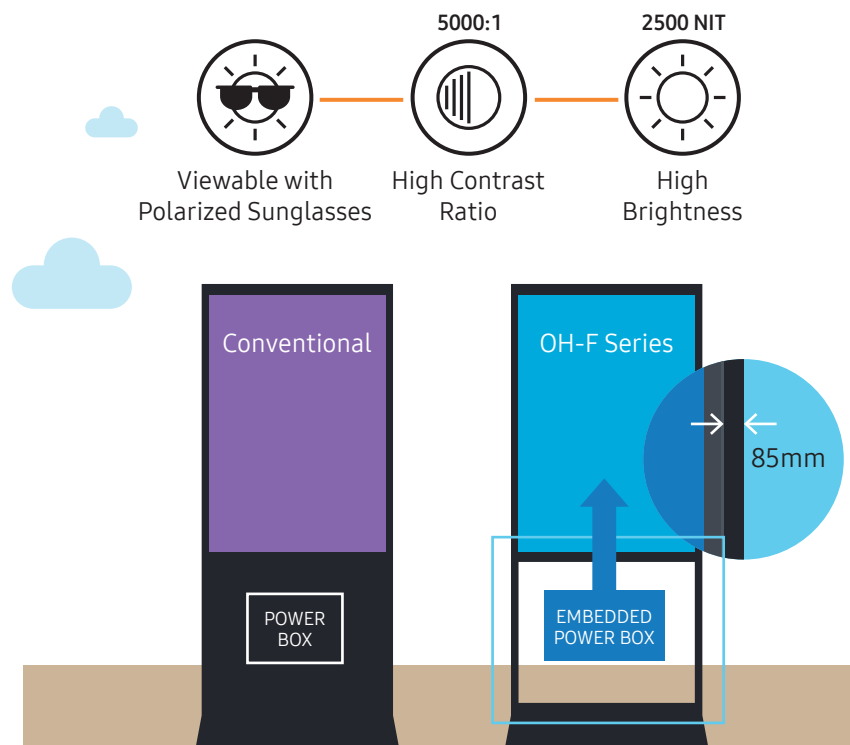
The importance of pedigree

Daylight-readable, weather-tolerant displays were largely a niche, almost novelty product a decade ago. The major brand manufacturers that consumers knew and trusted were not involved as makers or suppliers. So, the specialty display business had to find its own sets of suppliers and do the legwork, testing and validation to come up with solutions they'd not only market, but sell with a warranty.

Both Idems and Lee have seen countless examples of small, unfamiliar manufacturers producing and selling solutions for outdoor projects that ended badly, because the expertise wasn't there, the engineering was flawed, and the support and after-care was limited or non-existent.

It's a big deal, they say, to have companies like Samsung now manufacturing product specifically for these kinds of projects. A major manufacturer like Samsung brings immense R&D resources and economies of scale, says Idems. But more than anything, it creates credibility and trust among buyers.

"For a long time, that was our single biggest obstacle to closing sales – questions about our suppliers," relates Idems. Describing suppliers as unknown manufacturers on the other side of the planet made buyers uneasy. "When I was able to say 'Samsung,' it all changed."



Looking Ahead

Research shows that while it may seem like there are screens everywhere in our working and consumer lives, the actual market penetration remains relatively low. That will change rapidly in the coming years – both indoors and outside.

The technical challenges have been resolved, so the focus has now turned to how screens outside get stitched into how we do things – from accessing information to making purchases.

In drive-thrus, for example, displays will be much more than digital versions of posters and meal beauty shots. Some major QSR companies are already testing ordering and payment using smartphones, with walk-up and drive-thru pickup windows.

Technology such as Bluetooth beacons and dedicated mobile apps will recognize customers as they enter zones, and both welcome them and upsell to them on screens, using dynamic data.

Cameras embedded with screens are generating analytics on lane speeds, demographic profiles and even sentiment.

One operator is even using one of the screens in its drive-thru to let customers know the state of traffic in the immediate area, potentially warning them off a planned route.

The possibilities are endless, but what's clear now is that consumers both welcome and expect screens as part of their interactions. The early days were rough, but the technology and expertise are now there to fully deliver on those expectations.



OMD-W Series

2,500 nit Storefront Window Solution



OMH Series

1,500 nit Storefront Window Solution



OHF Series

A Complete, All-in-One Outdoor Signage Solution. Self-contained ultra-slim display with an embedded power box, housed in an impact-resistant enclosure and thermally protected by a patent-pending steady cooling system with IP56 certification for outdoor installation.

Learn more: [Digital Signage Solutions from Samsung.](#)

Footnotes

© 2018 Samsung Electronics America, Inc. All rights reserved. Samsung is a registered trademark of Samsung Electronics Co., Ltd. All products, logos and brand names are trademarks or registered trademarks of their respective companies. This white paper is for informational purposes only. Samsung makes no warranties, express or implied, in this white paper.

Learn more: samsung.com/outdoordisplays | insights.samsung.com | 1-866-SAM4BIZ

Follow us: [▶ youtube.com/samsungbizusa](https://www.youtube.com/samsungbizusa) | [🐦 @samsungbizusa](https://twitter.com/samsungbizusa)

SAMSUNG