



PHILIPS

e-Skin

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an opportunity to
change the way
we see the world

Smart windows, in buildings or vehicles,

which change their opacity and thermal properties automatically to compensate for changing environmental conditions. Brightly colored posters or signs that entice customers using nominal power. Ambient wallpapers which can set any scene to match the mood. Fashion-conscious people changing the color of their phone to match their outfit.



These futuristic visions have been foreseen in science-fiction literature for a hundred years – and now they can be realized. e-Skin technology will change the way we see our world, offering practical benefits and aesthetic appeal that will raise the possibilities of property personalization to new heights.

Philips has brought the ultra low-power, lightweight, full-color e-Skin technology through the primary stages of development and has completed proof of concept. Now we invite you to take over and realize the true potential of this game-changing technology. With Philips' proof-of-concept demonstrated and the technology backed by a total of 113 patent rights of which 70 have already been granted, e-Skin now requires the right commercial development environment to reach production.

Certainly, it's a significant undertaking requiring the combined technical proficiency of chemical, glass and printing experts. However the potential rewards are significant, with market estimates just for smart window applications exceeding US\$ 60-80 billion by the end of the decade.

e-Skin technology benefits

- A single solution that can reflect both light and heat
 - Full, bright color programmable static display technology
 - Large transmission range (70% to 1%)
 - Extremely low power consumption ($\mu\text{W}/\text{cm}^2$)
 - High switching speed (seconds) over a large area and temperature range
 - 113 patent rights of which 70 have already been granted
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The e-Skin patent portfolio contains 21 patent families holding a total of 113 patent rights of which 70 have already been granted while 43 are still pending. Within the 70 granted patents are 17 granted US patents, and 13 granted EP patents (the remaining patents being granted in CN, JP, KR and TW).

At Philips we believe e-Skin is poised to become a ubiquitous window and display material. Offering a completely new perspective it will be seen, or indeed not seen, everywhere. It can be used to improve or enhance many diverse applications. Due to e-Skin's negligible energy consumption, power usage for new applications is immaterial which makes remote operation possible via energy harvesting.

With a simple e-Skin layer, glass becomes smart glass

e-Skin has a very broad range of potential applications but one of the most promising large-area applications is smart windows. These can be exterior or interior windows in public or residential buildings. Smart glass is also being used in aircraft, automotive and marine applications.

At its simplest level in home and office windows, e-Skin can be switched on to act as a blind, reflecting heat but allowing light to pass. A more elaborate example is to coat the windows together with non-transparent surfaces such as roofs with e-Skins. This forms an invaluable environmental control asset for buildings in countries with variable climates, where the e-Skin color adapts to the season – soaking up the sun's energy in winter while redirecting it during summer.

A new sign of the times

Although e-Skin is defined as non-pixelated panels, a pixelated version of the technology will enable bright full color reflective e-paper displays without compromising viewing angle. With its potential for attractive, low cost information and graphical displays that extend from small scale to large scale applications, e-Skin will have an enormous impact on the entire digital signage market. From electronic shelf labels and retail signage to transportation signage and e-billboards – everything will be seen in a new light.



An ultra low-power, lightweight, full-color technology

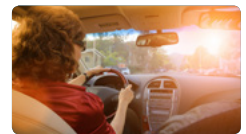


e-Skin technology (based on in-plane electrophoretics) provides a number of superior technical properties including greater transmission range, lower power consumption and faster switching speed over a large temperature range.

The energy consumption of e-Skin panels is extremely low. During switching this is in the order of $\mu\text{W}/\text{cm}^2$. To keep a panel in an optical state only requires a few nW/cm^2 or even completely zero. This is not only beneficial for energy saving, it also opens up the possibility to use energy harvesting, enabling zero-energy e-Skin devices.

e-Skin has also been designed for large area, low cost manufacturing processes, such as roll-to-roll plastic manufacturing. This will allow significant reductions in cost, further opening up and expanding into new market opportunities.

For more information please watch these videos or contact andrew.g.p.hall@philips.com



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