

OLED Technology:

„Challenges and new opportunities,,

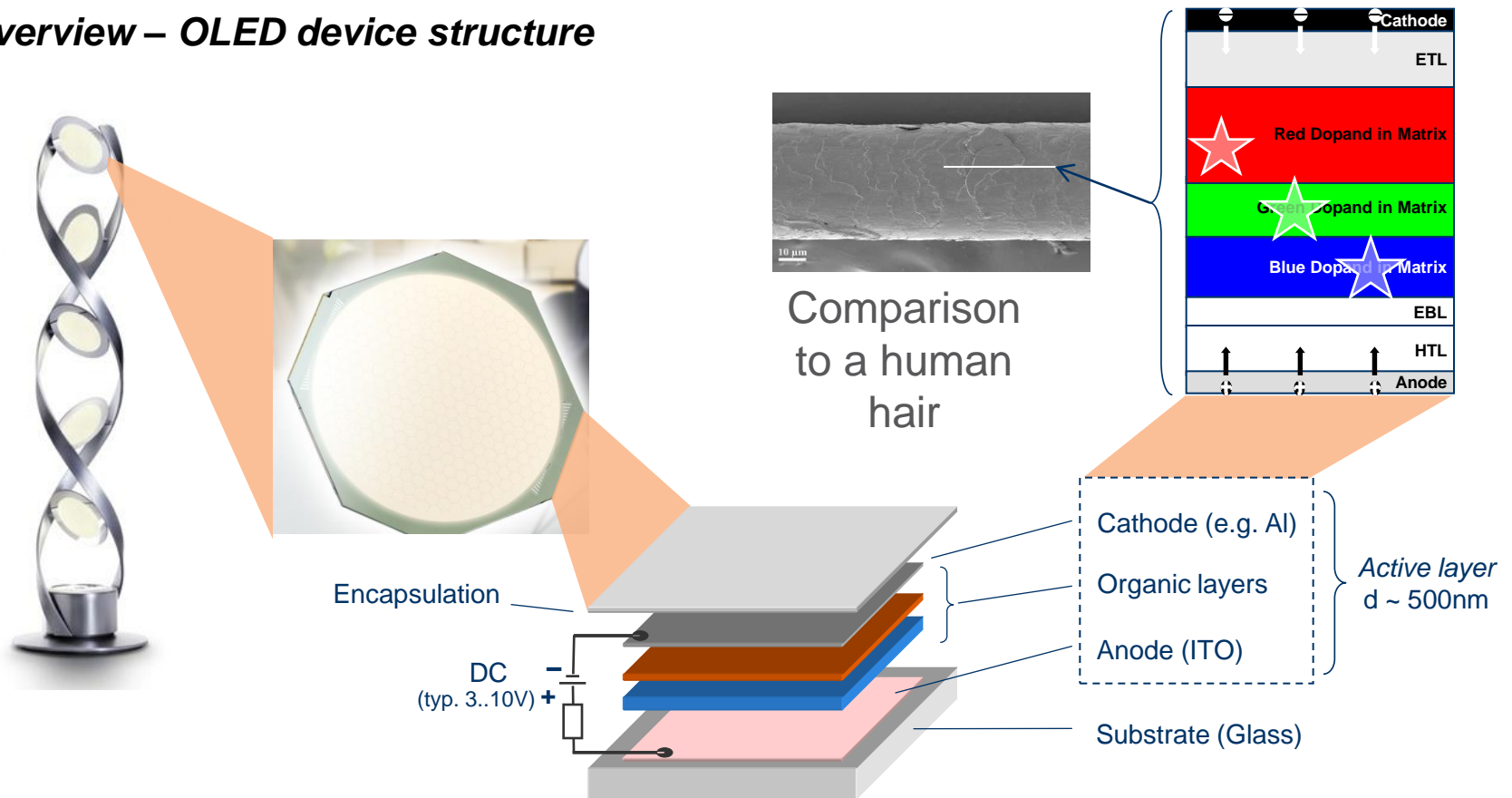
Steven Rossbach

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1. OLED technology introduction
 2. General lighting applications
 3. Automotive applications
 4. New applications
-

OLEDs are thin lighting devices made from organic semiconductor materials

Overview – OLED device structure

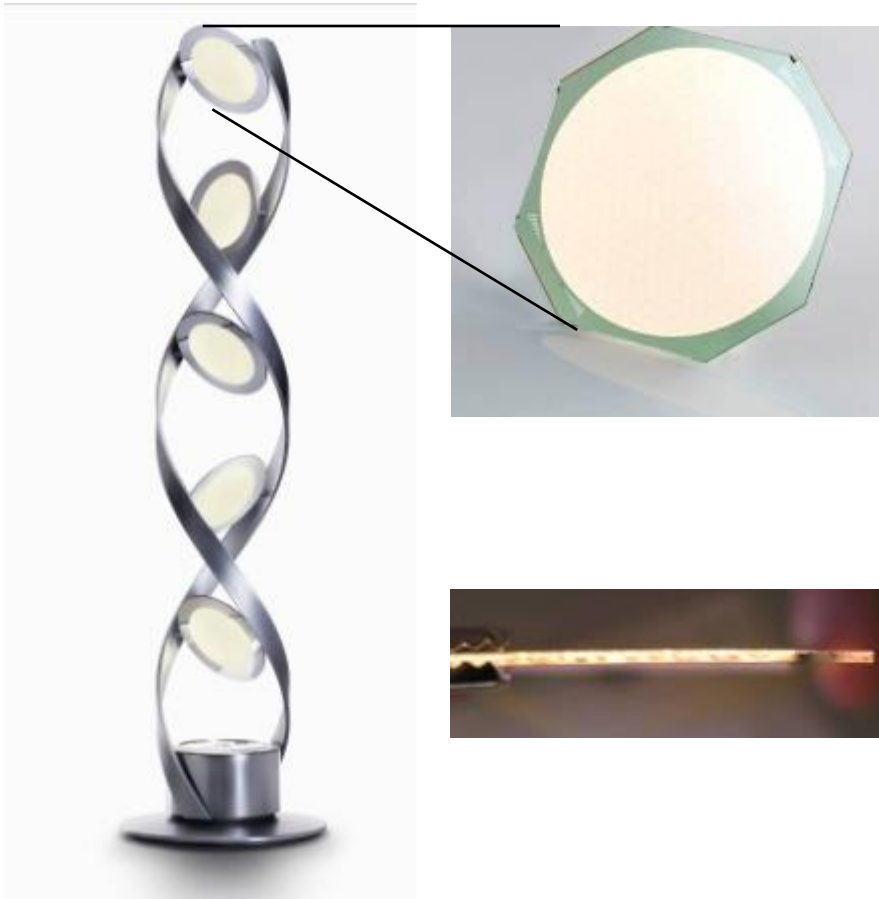


Layers of organic materials sandwiched between anode and cathode...

We are sure the outstanding OLED USPs will be used for professional lighting



The combination of OLED features is very promising for lighting applications



- Instant on
- Mercury free
- Fully dimmable
- Energy efficient
- No glare
- UV-free
- Touchable
- Easy to implement
- Sustainable
- Long lifetime
- Ultra flat

Feature 1: Transparent OLEDs



Unique Qualities of transparent OLEDs

- Absolutely clear view without any haze
- Scratch resistant glass
- Emission ratio 60/40 to 80/20 between front and backside light



Feature 2: Flexible OLEDs



**Efficiency
world
record!**



Unique Qualities of flexible OLEDs

- Curvature adjustable light sources
- Bendable light sheets
- Ultra-flat

Feature 3: Mirroring surface



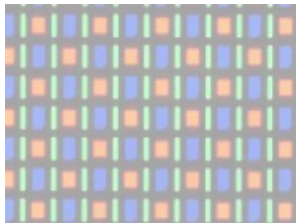
Unique Qualities of mirroring OLEDs

- OLEDs can be mirroring in “off-state”
- Seamless integration in mirror
- Aesthetical application solutions

OLED Applications

Display

- Smart phone
 - TV
 - Camera
- Target: show information



General lighting



- Decorative
- Residential
- Hospitality
- Office

Automotive lighting

- Interior
- Exterior



other



- Gadgets
- Toys
- Furniture
- White goods

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OLED prototypes at “light + building”



OLED lighting as emerging topic for general lighting

2008

3 OLED luminaires all with OSRAM OLED



Osram with Ingo Maurer

2010

8 luminaire manufacturers presented OLED luminaire concepts with OLEDs by 7 suppliers



Schreder



Zumtobel

2012

26 luminaire manufacturers presented OLED luminaire concepts with OLEDs by 11 suppliers



Acuity Brands



Osram

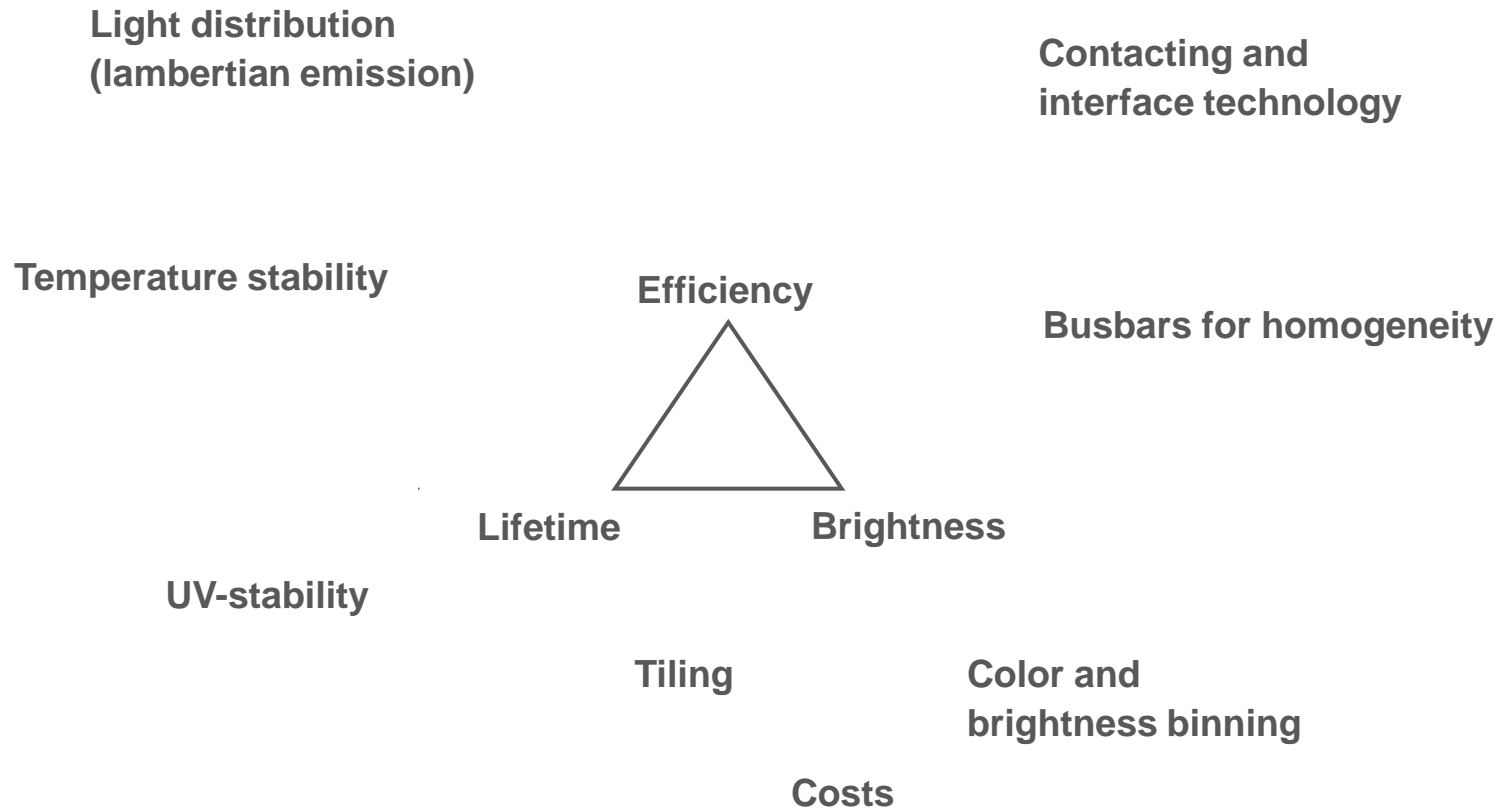


Selux

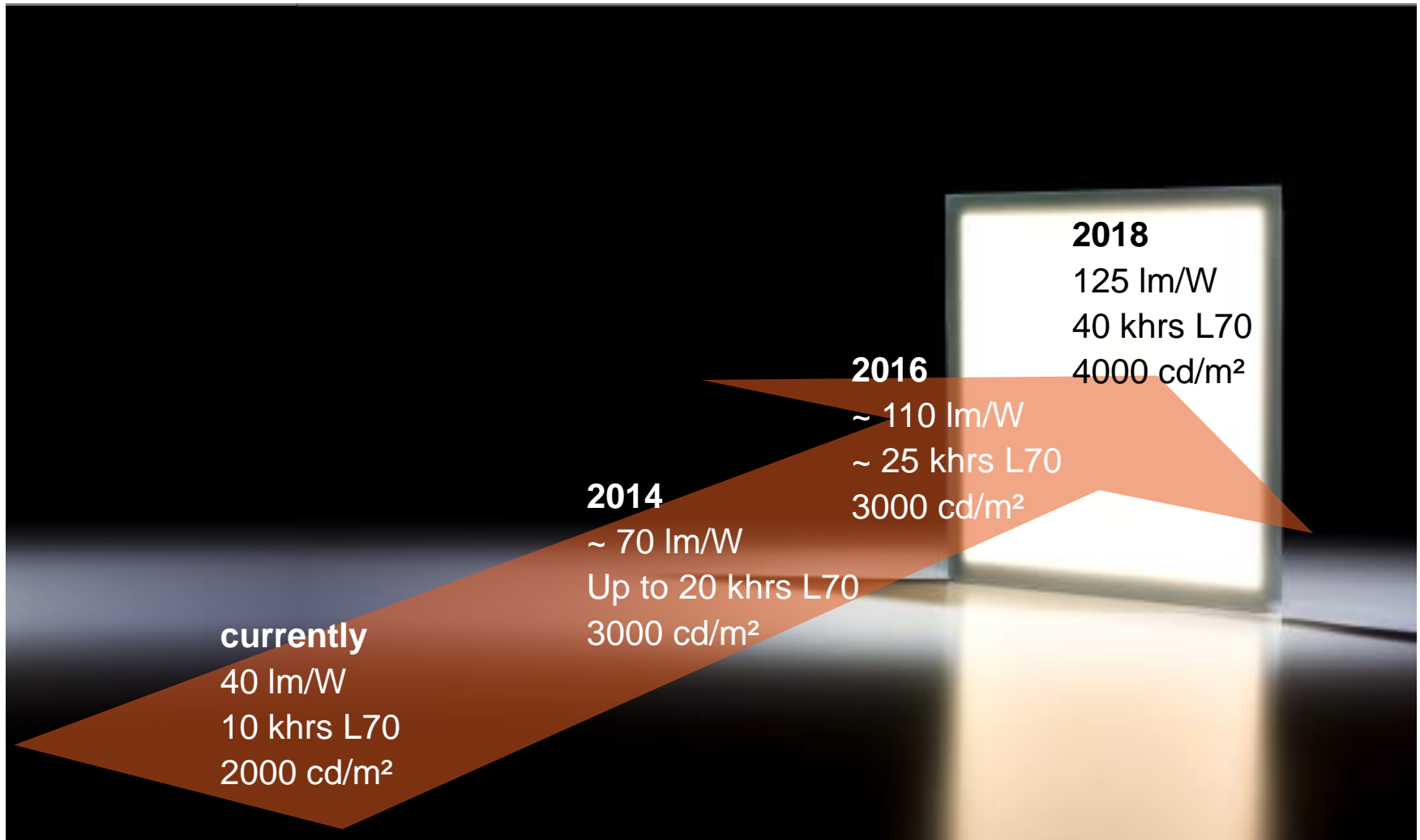
Tasks for the next years



There are some challenges for OLED lighting panels as a technical light source



General lighting - Performance Roadmap



Roadmap – Applications and Products



Transition Phase:

- Technical competitiveness
- Premium applications
- Functionality
- Component related projects
- Noticeable volumes

Penetration:

- Steady growth
- Standardized products



The Beginnings:

- Purely design and luxury driven luminaires
- Representative projects



Take-Off Phase:

- Mature performance
- Price competitiveness
- Conquering of first mass applications
- First system solutions
- Rapid growth



2012

2014

2016

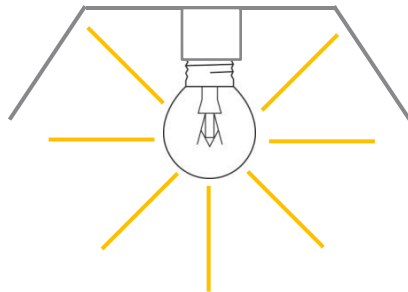
2018

2020

New possibilities: luminaire concept ideas



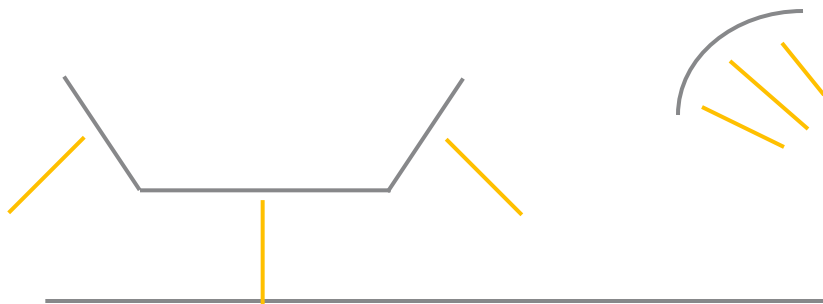
OLEDs can be the lamp shade of a luminaire



lamp + shade



OLED luminaire



Prototype: mmDesign



Rendering: www.lab.me

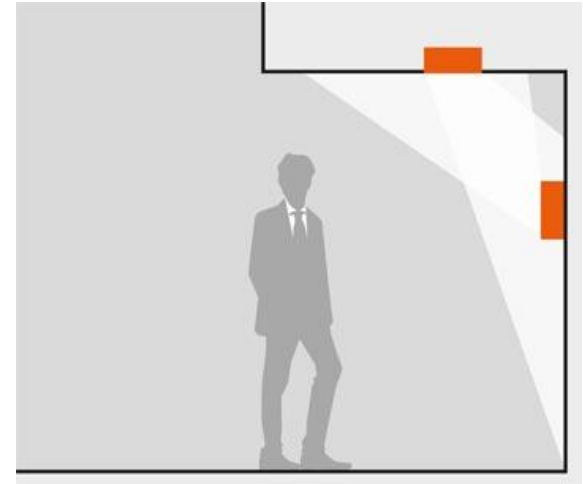
New possibilities: luminaire concept ideas



Vertical wall integration

Typical wall-washer applications:

- High brightness
- Indirect flux



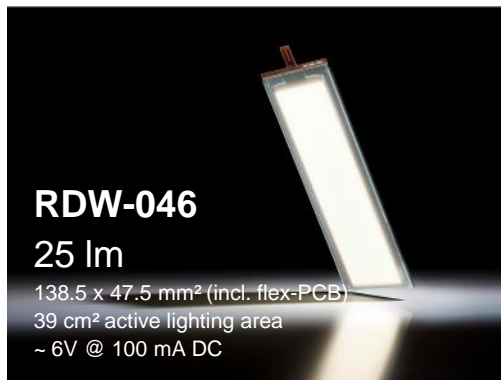
OLED in vertical areas:

- No glare
- Direct illumination
- No reflection losses

Example GL: OSRAM as a frontrunner in developing application specific solutions



Current “General Lighting” OLED portfolio



OLED panels¹⁾



- ➡ 2000 cd/m²
- ➡ 40 lm/W
- CRI ~80
- ➡ Lifetime 10.000 hours (decrease to 70%)
- Thin Film Encapsulated

OLED integration concepts



1) Available in following versions: Flex-PCB with 4 solder pads / Flex-PCB with 4 socket pins / Counterpart connector available (not RDW)

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“Easy jobs” – Lifetime & Electro-Optics

The **pure operating life** is moderate.

- Up to 15 years usage life
- ~ 8,000 hrs operating life

Luminance requirements are moderate

- Few 100 cd/m² for interior ambient
- Up to 3000 cd/m² sufficient for exterior

Efficacy levels

- White: ~25-30 lm/w (= Hal level) sufficient
- Red: Consensus on even lower levels (~12 lm/w)

Color white

- Highly flexible (3000 – 5500K) / CRI dependent

“Challenges” – esp. reliability criteria

- Scalable criteria (“Roadmap”)

Temperature profiles ranging up to minimum 85°C and higher

Up to 15 years storage life
(incl. Stability against humidity)

Stability against sunlight exposure

OLED RCL Demonstrator 2012 with the features mirror off-state and transparency



OSRAM OLED Rear light demo shown at Vision 2012, Electronica and DVN Workshop in Detroit (2013)



- Red and amber conforming to **ECE** standards
- **mirror** off-state and **transparent** OLEDs mounted at intervals of some centimeters
- some smaller OLEDs in between, indicating stop light
- Transparent OLED can act as light curtain
- multi layer arrangement creates **3D and depth effect**

→ Demonstrates design options enabled by OLED features

OLED RCL Demonstrator 2013 with the unique feature Segmentation

OSRAM OLED Rear light demo presented at ISAL (International Symposium on Automotive Lighting) in Darmstadt

- Ultra flat light source enables very flat RCL architecture
→ space and weight **savings**
- Single OLED exhibits three **independently** addressable segments
- Moderate brightness of 1/3 of segments for rear light; full brightness of all segments for stoplight
- Homogenous lighting of area light sources
- **Minimized gap** between independent segments
- “Coming Home” and “Leaving Home” scenarios
→ **Individualization** and additional recognition value



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New applications with OLED



Handheld device showing the following application ideas:

- One transparent OLED combined with one mirror OLED of the same size
- Search light: Max. light output when device is closed (both OLED upon each other)
- Reading light: Open device, only transparent OLED on, to be layed on a book
- Make-Up-Mirror: Open device, transparent OLED for smooth illumination, mirror OLED off & working as mirror
- Battery powered and USB chargeable



Novel OLED use: Thermobooth



- Interactive OLED installation:
- OLED light as flash for camera
 - Mirroring OLEDs
 - shutter release by contact between 2 people

Pictures and Media

<http://www.thermoboost.com/media>

Mentioned in press

<http://www.wired.com/design/2013/10/this-thermal-photo-booth-takes-a-photo-when-you-kiss>

<http://www.dezeen.com/2013/09/25/thermoboost-by-taliastudio/>

<http://www.designboom.com/technology/thermoboost-interactive-lo-fi-oled-mirror-photo-booth-by-taliastudio-09-30-2013/>

