Flexible Large Area LED Modules: Total Customisation & Smart Lighting Potential

Dr Derek Peden
Innovation Manager

SwissPhotonics Workshop

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Who Are We?

- SME, based in Scotland
- Head Offices near Edinburgh
  - Engineering
  - R&D & Innovation
  - Prototyping
- London Sales Office, focused on Retail Lighting & Architectural Lighting
- Manufacturing Licences
  - Parlex - world leader in flexible electronics
  - High Volume Lighting Manufacturer in Asia
Intellectual Property

- 51 granted patents
  - UK
  - European Patent Office
  - United States of America
  - China
  - Taiwan
  - India
  - Korea
  - Japan
  - Australia
Investors

- Siemens
- OSRAM GmbH
- IKEA GreenTech (of IKEA B.V.)
Our Strategy

Step 1.
**Focus** where we have a clear **Right to Win** in a **Valuable Market** segment

Step 2.
**Collaboration** in a high profile use case

Step 3.
**Strategic alliance** or partnership with **dominant market player**

Step 4.
**Joint commercial exploitation on a global scale**
Our Strategy in Action

1. Design Concept in Consumer Lighting

2. Design Collaboration
   - Ingo Maurer, Munich

3. Strategic partnership with dominant market player
   - IKEA

4. Joint commercial exploitation on a global scale
   - 2 rounds of investment
   - Technology Transfer to IKEA manufacturer
   - Collaboration on short/medium/long term products for international roll-out starting in Q1-18
Disruptive Lighting Technology
Disruptive Lighting Technology

• Thin, mechanically flexible LED lighting system

• Current technology base:
  • Screen printed electrical tracking
  • PET substrates
  • LED package SMT by thermally curable conductive epoxy
  • LED encapsulation by transparent polymer
  • Typical thickness of 1 - 2 mm, determined by LED
Surface Optics

- Textured inks
- White inks
- PET-based prism foils
Design LED Products Ltd | Confidential & Proprietary
Direct Lighting Example

- Linear flex product, *Clyde*
  - 0.5m lengths, 2 mm thick
  - 3W, 24V, 350 lm
  - 3000K, 4000K, 85 Ra
Tile light intensity distribution

- 90° PMMA prism film substrate
- Prisms against diffuse reflector
Diffused light intensity distribution

- Prismatic film substrate
- Prisms against diffuse reflector
- Diffuser on resin surface
• Focused illumination from lambertian LED
• High light quality - no shadow artefacts
Surface Optics

- Textured inks
- White inks
- PET-based prism foils

> Clear ink - *index matched to prism structure*
side-emitting inorganic LED

printed circuit & low temperature bond

prism foil

surface optics

TIR
Planarised surface optics
Customisation

- Form Factor
  - Size, ≤ 0.5 m per module
  - Shape

- LED
  - Quantity
  - CCT (2700 K - 6500 K)

- Electrical Layout
  - CV
  - CC

- Interconnect
  - Pin-Header
  - Custom IDC (IP67)
  - FFC tail
  - Other
European Projects
Smart Lighting
Smart Lighting

• Large Area Electronics
• Film based system for smart light integration
Smart Lighting

• Electronics Integration
  • Packaged Devices
  • Chip Integration

• Sensing

• Control

• Connectivity
Smart Lighting

- Human Centric Lighting
  - Wellbeing
  - Sustainability
  - Circular Economy

- Smart Horticultural
  - Vertical Farming
  - Hydroponics
  - Aquaponics
e.g. Growth Monitoring

- Proximity Sensing
- Colour
- Environmental
What’s Next?
What’s Next?

• EU Funded Collaborations
• Joint Development
Materials & Processing

• Roll-to-Roll Manufacture
• Fine-pitch printing & SMT
• Electronics Integration
• Optical Films
• LED Packaging