OLED Presentation

Organic Light-Emitting Display

For Passive Matrix
Structure of OLED

- Anode
- Hole injection layer
- Emission layer
- Hole transport layer
- Electron transport layer
- Electron injection layer
- Cathode
- Desiccant
- Cap
- Substrate
- Polarizer
Advantage of OLED

- Full view angle
- Fast response
- High contrast
- Simple structure
- Good performance under low-temperature
Milestone of TRULY PMOLED

- Started mass production of G2.5 lines
- Started mass production of pilot line
- Got Patent licensing from Kodak
- OLED RD team founded
Current Capacity of TRULY PMOLED

- H2 200mm × 185mm
- P2 370mm × 470mm
- P1 370mm × 400mm

Cost comparison between **Pilot Line (H2)** and **Gen2.5 Line (P1&P2)**:

- **Pilot Line**: Lower tooling cost but higher unit price.
- **Gen2.5 Line**: Higher tooling cost but lower unit price.
We have a new G2.5 line which will start MP from August 2016. With this new line, the total capacity will be increased to 3mil/M from August 2016, and 5.5mil/M from November 2016.
Product summary

- Driving Method: Passive
- Display Color: mono(red, green, blue, yellow, white) /area color, full color (65K, 262K)
- Display mode: dot matrix, segment, character;
- Brief spec. : 0.2in ~ 3.5in , 1/160 duty
- New product: Transparent, OLED w/ on-cell touch key
Customer & Application

- IBM
- at&t
- verizon
- SUB-ZERO
- Sennheiser
- Alcatel-Lucent
- Clarion
- Lutron
- Netgear
- Harman
- Tendyron

- Car Audio
- Consumer electronics
- Medical instrument
- Communications equipment
- Industrial instrument

App
### PMOLED Product list for Wearable devices

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Display Size</th>
<th>Resolution</th>
<th>IC Type</th>
<th>Color</th>
<th>MP Type</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEL9M0093-Y/G/R/W/B-E</td>
<td>0.48&quot;(72*32)</td>
<td>128*128</td>
<td>SSD1309Z, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
</tr>
<tr>
<td>OEL9M1024-Y/G/R/W/B-E</td>
<td>0.66&quot;(64*48)</td>
<td>96*96</td>
<td>SSD1306, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
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<tr>
<td>OEL9M0092-Y/G/R/W/B-E</td>
<td>0.84&quot;(96*18)</td>
<td>128*64</td>
<td>SSD1307Z2, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
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<tr>
<td>OEL9M0084-Y/G/R/W/B-E</td>
<td>0.91&quot;(128*32)</td>
<td>96*96</td>
<td>SH1103G, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
</tr>
<tr>
<td>OEL9M1010-Y/G/R/W/B-E</td>
<td>0.95&quot;(96*64)</td>
<td>96*48</td>
<td>SH1106G, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
</tr>
<tr>
<td>OEL9M0083-Y/G/R/W/B-E</td>
<td>0.96&quot;(128*64)</td>
<td>128*64</td>
<td>SH1106, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
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<tr>
<td>OEL9M1003-L3-E</td>
<td>1.1&quot;(96*96)</td>
<td>96*96</td>
<td>LD7134, Full color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
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<tr>
<td>OEL9M1007-Y/G/R/W/B-E</td>
<td>1.12&quot;(96*96)</td>
<td>96*48</td>
<td>SH1107G, mono color</td>
<td>Mp</td>
<td></td>
<td>rectangular</td>
</tr>
<tr>
<td>OEL9M1025-Y/G/R/W/B-E</td>
<td>1.12&quot;(128*128)</td>
<td>128*128</td>
<td>SH1107G, mono color</td>
<td>MP</td>
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<td>rectangular</td>
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<tr>
<td>OEL9M0092-Y/G/R/W/B-E</td>
<td>1.5&quot;(128*128)</td>
<td>96*48</td>
<td>SH1107G, mono color</td>
<td>Pp</td>
<td></td>
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</tr>
</tbody>
</table>
**Product Roadmap for Automotive**

- **2015.Q3**
  - **Mono**
  - **Segment (89seg)**
  - **Brightness:** 300nits

- **2015.Q4**
  - **Area color**
  - **Segment (<150seg)**
  - **Brightness:** 100~200nits

- **2016.Q1**
  - **Dot matrix (<80duty)**
  - **Brightness:** 100~200nits
  - **Color:** R/G/Y

- **2016.Q2**
  - **Mono**
  - **Dot matrix (<80duty)**
  - **Brightness:** 100~200nits
  - **Color:** R/G/Y

- **2016.Q3**
  - **Mono**
  - **Dot matrix (<80duty)**
  - **Brightness:** 100~200nits
  - **Color:** W

- **2016.Q4**
  - **Mono**
  - **Dot matrix (<150duty)**
  - **Brightness:** 100~200nits
  - **Color:** R/G/Y/W

- **2017.Q1**
  - **Mono**
  - **Dot matrix (<150duty)**
  - **Brightness:** 100~200nits
  - **Color:** R/G/Y/W
Featured Products

- Display OFF
  - 0.56in 54 Segments, monochrome
  - Transmittance: 40%
  - Target market: range finder, night vision device, accessories etc.
  - Key feature over LCDs: Self Emission
PMOLED with On-cell touch key
On-cell OLED structure

- Traditional type
  - Touch panel
  - OCA
  - POL
  - OLED

- On-cell type
  - POL
  - OLED
  - On-cell layer

Brighter
Thinner
Simpler

Thickness can be 1.2mm
Truly On-cell OLED structure

- Substrate
- Seal
- Dessicate
- Cathode
- OLED
- ITO layer
- Polarizer
- On-cell layer
- TP-FPC
- IC
- OLED-FPC
Roadmap for on-cell OLED

- Touch Key on-cell OLED first sample on G2.5 Line (mono color)
- Sample (Touch-Key) can be customized
- Sample stage
On-cell OLED target market

- Smart watch
- Wrist band
- Smart home system
  - Industrial
  - Medical
• Curved PMOLED
OLED Development

- Rigid
- Curved
- Foldable
- Rollable

- Glass substrate
- Polymer substrate
**Roadmap for Curved OLED**

- **First engineering sample**
  - AA dimension: 1.59” PMOLED
  - Curved Radius: 50mm
    - Color: white
    - Driving: COG

- **First official sample**
  - AA dimension: 1.6” PMOLED
  - Curved Radius: 40mm
    - Color: white
    - Driving: COG

- Mass-production

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Curved OLED structure

- Rigid OLED
  - POL
  - OLED-substrate
  - OLED-CAP

- Curved OLED
  - Curved POL
  - OLED-substrate
  - OLED-Cap

Glass → Rigid OLED → Curved OLED → Polymer
Curved OLED Target Market

- Curved watch
- Curved wrist band
Thank you!