Major Milestones - Technology
• Past - Present - Future

- Resistive Touch Panel
- Capacitive Touch Panel (BM/ SITO)
  - CSTN Panel & Module
  - ZBD Bi-Stable Display
  - GDV (Vertical Alignment) Display
  - GDF (Field Sequence) Display
  - High Resolution TFT Module
  - FSTN/STN/TN Display
  - COG/TCP/COB/SMT Module

- Past
  - 1991-2003
  - CSTN Panel & Module
  - ZBD Bi-Stable Display
  - GDV (Vertical Alignment) Display
  - GDF (Field Sequence) Display
  - High Resolution TFT Module
  - FSTN/STN/TN Display
  - COG/TCP/COB/SMT Module

- Present
  - 2004-2010
  - Resistive Touch Panel
  - Capacitive Touch Panel (BM/ SITO)
  - Ultra High Definition 2k/4k TFT Module
  - OGS Capacitive Touch Screen
  - Full Lamination (TP & Display)

- Future
  - 2011-2013
  - Ultra High Definition 2k/4k TFT Module
  - TFT Module for Automobile
  - Full Lamination (TP & Display)

- Future
  - 2014-2016
  - Capacitive Touch Panel for Automobile
  - Ultra High Definition 2k/4k TFT Module
  - Flexible Touch Screen
  - Flexible Touch Screen
  - TFT Module for Automobile

- Future
  - 2017-2019
  - Less Sparkle AG CTP
  - Ultra Low Reflectance Automotive CTP
  - Low Color Deviation of Full Lamination TP Module
  - High-Durable P+G CTP
  - Salt Water Touch & Anti-erosion CTP
  - Customized TFT LCD

- Future
  - 2020 -
  - Customized TFT LCD
  - Panda Black OGS / Cover
  - IML Curve Touch Screen
  - Pilatus invisible Bridge
Technology Upgrade 2019/2020

In House developments

Flexible Touch Panel

- Using PI substrate with higher reliability as PET
- Same sputtering process as glass CTP
- Patents: 17 applied
- Demo building in progress: S-shaped 2 x 10in Displays
- Automotive sample: 2021 Q1; Mass production: 2022 Q2

<table>
<thead>
<tr>
<th>PI</th>
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<tbody>
<tr>
<td>Minimum thickness</td>
<td>15µm</td>
</tr>
<tr>
<td>Bending test</td>
<td>R 6.5mm, 200k times</td>
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<tr>
<td>CTE</td>
<td>15</td>
</tr>
<tr>
<td>Transmission</td>
<td>&gt;90%</td>
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<tr>
<td>Haze</td>
<td>&lt;0.5</td>
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<td>High temp</td>
<td>-40°C~90°C, 1000h</td>
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<tr>
<td>High temp/High humidity</td>
<td>85°C/85%, 1000h</td>
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<tr>
<td>Thermal shock</td>
<td>40°C~90°C, 240h</td>
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Technology Upgrade 2019/2020

In House developments

Panda Black OGS 3.0 Touch Panel

- Using multilayer index matching to reduce reflection
- Optimized for TFT, OCR and surface treatment
- $\Delta E$ between BM and VA under 1.7%
- Reflection lower than 1.7%
- Using AR film Dexerials

<table>
<thead>
<tr>
<th></th>
<th>BM</th>
<th>AA</th>
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<tr>
<td>Reflection</td>
<td>1.63</td>
<td>1.45</td>
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<tr>
<td>L’</td>
<td>13.43</td>
<td>12.29</td>
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<tr>
<td>a’</td>
<td>0.31</td>
<td>-0.61</td>
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<tr>
<td>b’</td>
<td>-4.72</td>
<td>-3.96</td>
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<tr>
<td>$\Delta E$</td>
<td>1.65</td>
<td>1.65</td>
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Technology Upgrade 2019/2020

In House developments

Panda Black cluster lens

- Same Technology as Panda Black OGS but for clusters or in-cell TFT
- BM coating instead of ink printing
- $\Delta E<1$ without AR film
- $\Delta E<2$ with AR film
- Surface AGAR treatment is optional

<table>
<thead>
<tr>
<th></th>
<th>$\Delta E$</th>
<th>$\Delta a$</th>
<th>$\Delta b$</th>
<th>$\Delta E$</th>
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<tbody>
<tr>
<td>w/o AR film</td>
<td>0.35</td>
<td>0.25</td>
<td>0.47</td>
<td>0.64</td>
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<tr>
<td>with AR film</td>
<td>0.85</td>
<td>0.83</td>
<td>0.95</td>
<td>1.52</td>
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Base on OCR bonding unit
Color of TFT: L=-28.65 / a=-0.46 / b=-0.29
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In House developments

“Pilatus” automotive touch screen

- Bridge and ITO invisible technology
- No bridge reflection under strong light
- New index matching design reduce the reflectance between ITO pattern and gaps
- New bridge design reduces shining issue

OCR Optical Bonding line

- OCR bonding for the big size LCD
- Gel like bonding
- Up to 30in Cover lens bonding
Technology Upgrade 2019/2020
Developments with our partners

Salt Water Touch & Anti-corrosion CTP
- Operation under 5% salt water spraying
- IC software with special algorithm
- Cover lens with additional coating layers

High-Durable Plastic Cover Lens
- High Adhesion, High-Endurable, Low reflectance AR coating
- Good for Anti-shattering and head-impact performance.
Technology Upgrade 2019/2020

Developments with our partners

IML Curve Cover Lens

- Cold shaping
- Achieve 135-180° angle
- Suitable for optical bonding

Less Sparkle AG Cover

- Less Sparkle through Moth-eye treatment (hexagonal pattern coating)
- Less Sparkle by reducing the surface glare
- Haze: ≤20%
- Surface Roughness: <0.1μm
- Transmission: ≥87%
New available Products

Touch / Cover / Lamination - Developments

Double 12.3in Touch Module
- Full black for cluster and CID
- Uniformity black with & without TP
- Ultra low reflectance

BM Cover Lens
- Processing @ high accuracy yellow patterning line
- Full black with LCD & TP module assembled

Panda Black Low Color Deviation Modules
- Sputtering treatment under sensor pattern
- Uniform black for viewing area and black mask
- Color deviation $\Delta E$ to be less than 1.7%
New available Products

LCD - Developments

High Duty VA Display
- Driving: up to 128*128 (1/128 duty)
- Contrast: Vertical view >50:1
- Response: <300ms

Large size ASTN LCD
- for outdoor application
- VA area: 9.51in
- Contrast: 150:1

High Cost-Effective Ammeter LCD Module
- Reliability: 60°C *90% RH*1000H
- High temperature storage: 90°C, 500H
- Low temperature storage: -40°C, 1000H
- Radiation: 1120W/m²
Contact
Get in touch with us

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