Mitsubishi TFT-LCD for Industrial Application

10th September, 2013
Melco Display technology Inc.
Hiroshi OHJI
Contents

• Introduction of Mitsubishi LCD Div.
• Policy of Mitsubishi TFT-LCD
• Products Features
Enhancement of Productivity & Quality
Enhancement of Development & Intellectual Property
Improvement of Material Procurement
Enhancement of Financial Condition
Effective Utilization of Human Resources

Corporate-level Support

Advanced Technology R&D Center
Information Technology R&D Center
Industrial Design Center
Manufacturing Engineering Center

Mitsubishi Semiconductor Device Group is ranked as supporting other Groups of a crucial key parts supplier and expected long term availability

Enhancement products’ competitiveness by corporate synergy
**Overall information of Mitsubishi LCD division & MDTI**

### LCD division
- **Duties:** Business planning, Design, Quality insurance
- **Location:** Kumamoto, Japan
- **Products:** AM-LCD’s for Industrial & Automotive application

### MDTI = Melco Display Technology Inc. (100% owned subsidiary of MELCO)
- **Duties:** Production
- **Location:** Kumamoto, Japan
- **Mother Glass Size:** 410 mm x 520 mm (Generation 2.5)
- **Production Capacity:** 65,000 mother-glass sheets a month
- **Started Operation:** May 1996 (began as ADI)
- **Quality Certificate:** ISO-14001, TS-16949 (LCD div. & MDTI)
- **Feature:** Flexibility to meet customer’s various needs.
Mitsubishi is supplying high quality & high reliability Products for many applications
# Difference between Industrial and Consumer LCD

## 1. Application case

<table>
<thead>
<tr>
<th></th>
<th>Industrial</th>
<th>Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Everywhere (outdoor)</td>
<td>Indoor</td>
</tr>
<tr>
<td></td>
<td>Very severe</td>
<td></td>
</tr>
<tr>
<td>Lifetime</td>
<td>Nearly 1 decade</td>
<td>A couple of years</td>
</tr>
<tr>
<td>Operating time</td>
<td>24 hours</td>
<td>Within half a day</td>
</tr>
<tr>
<td>Application</td>
<td>Part of a system</td>
<td>Individual</td>
</tr>
<tr>
<td>Reliability</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

## 2. Spec difference

<table>
<thead>
<tr>
<th></th>
<th>Industrial</th>
<th>Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brightness</td>
<td>600 ~ 1500 cd/m²</td>
<td>About 300 cd/m²</td>
</tr>
<tr>
<td>Backlight Lifetime</td>
<td>100K hours</td>
<td>30k-50k hours</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-30 ~ 80 deg C</td>
<td>0 ~ 50 deg C</td>
</tr>
</tbody>
</table>
# Difference between Industrial and Consumer LCD

## 3. Market size

<table>
<thead>
<tr>
<th></th>
<th>Industrial</th>
<th>Consumer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market volume</strong></td>
<td>US$ 1.2 Billion (1/100 of Consumer market)</td>
<td>US$ 100 Billion</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>1. LCD for Outdoor (Ex. ATM)</td>
<td>TV, NBPC/PC Mobile</td>
</tr>
<tr>
<td></td>
<td>2. LCD for long term use (Ex. Industrial monitor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. LCD for severe environment (Ex. Marine)</td>
<td></td>
</tr>
</tbody>
</table>
Market Trend for Industrial application

- Market has shrank by two recessions- Lehman’s fall and Euro crisis.
- Market of ’14 shows gradual growth and is expected to reach as the same level as ’08.
- Mitsubishi has been expanding market share without relation to these recessions.
- The sales will reach into $200M and the share will exceed 15% in ’14.
Policy of Mitsubishi TFT-LCD

Mitsubishi has supplied high reliable LCD products for industrial use over the long term

1) Products design based on the long-term use
   - Super long-life (typ.100,000hr) and replace-free backlight (LED)
   - Mount position compatibility for model change
   - Application of common image signal I/F

2) Supply system with high reliability
   - Long term supply
   - Traceability for each product
   - Quality assurance support for customer

3) Improvement of the function for industrial use
   - Use under wide temperature range : -30 ~ 80℃
   - Outdoor use visibility : Super high brightness, Glass (Optical) Bonding
   - LED backlight : Low power consumption, Mercury (Hg)-free
Mitsubishi Products Strategy

Mitsubishi mainly focuses on the two demands.

1. Demand for high performance and reliability (Outdoor, Medical)
   Customer requires high technological products as follows:
   - PCAP Touch Panel
   - PCAP (Optical) Bonding
   - Super Wide View Angle
   - Outdoor Readability : High brightness LED Backlight & Glass (Optical) Bonding

2. Demand for good enough standard (ATM, POS)
   Customer requires price competitive products in these large volume market.
   - Outsourced LCD module (12.1” & 15” )
Key Technology : Super –wide-viewing –angle-G3

Super-wide-viewing-angle-G3 realizes both super-wide-viewing-angle and high-transmittance.

(1) TN type display (conventional):
Narrow viewing-angle / **High**
transmittance

(2) **Super-wide-viewing-angle-G3** display:
**Wide** viewing-angle / **High**
transmittance
Application of Super-wide-viewing angle-G3

- Ultrasonic Diagnostic
- Home Automation
- Elevator
- Aviation
- Super-wide-viewing-angle
- Broadcasting
Key Technology: Projected Capacitive (PCAP) Touch Panel

TFT-LCD with PCAP touch panel best fits for industrial applications
Good for long term use and wide variety operation environment

- Total Support (Performance · Quality · Long term support)
- Intuitive operation (Pinch-in · Pinch-out · Flick operation)
- Clear image quality (Highly transmittance · Excellent color quality)
- Clear image even in bright outdoor environments

- Cover glass
  Thickness: 2.8mm (max)
- Black mask printing, etc
- Glass bonding

- Controller interface
  UART, USB

- OS (Operating System)
  Windows 7, Linux

- Glass bonding
Application of Projected Capacitive (PCAP) Touch Panel

Mitsubishi can provide solution device integrated LCD and PCAP.

【Industrial Market】

- Instrument
- ATM
- FA
- Marine
- KIOSK

Total support with warranty!!
Features of Mitsubishi Glass / Touch Panel Bonding

- Excellent screen image quality under the sunlight
- No condensation between LCD and glass
- Improvement of mechanical strength
- Optimal combination with Mitsubishi PCAP
- Full benefit of factory warranty
- Total solution (Total product design and FAE support)
**New Technology:**

**Intelligent Graphical User Interface Technology**

- LCD, PCAP and graphics board in one package.
- Easy installation of customer contents.
  - without annoying programming procedure.
  - saving development cost drastically.

Commercially available drawing tool (ex. Adobe Flash)

Design support tool
COLOR TFT-LCD MODULES FOR INDUSTRIAL USE

Excellent Performance, Better Choice for the Next Step