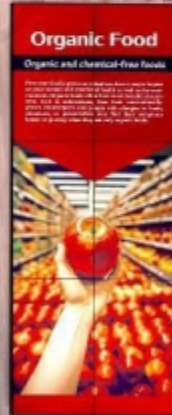




ePaper Display Usage Guidelines

R&D Dept. 2024/08/22



General Guidelines

Handling and Operation Precautions for ePaper display

Operation Precautions for Flexible ePaper display

Designing the End-Customer Product

Guidance for Touch Screen

Storage Guidelines for ePaper Displays

General Guidelines

Consider the Following Aspects to Determine the Best fit for your Application:

Update Cycle:

- ePaper Displays are suitable for update cycles ranging from tens of seconds to minutes.
- Most of the black-and-white electronic paper screens released by Good Display have a fast refresh rate of 1.5 to 2.5 seconds and a partial refresh rate of a few hundred milliseconds, but please provide your specific requirements for further assistance.
- ePaper Displays are ideal for applications where a static image is maintained without constant electricity and doesn't require frequent refreshing.

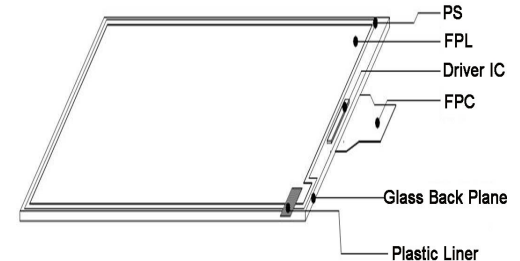
Temperature & Colors:

- Note that Multi-color ePaper displays cannot operate at sub-zero temperatures.
- For operation under 0°C, the Wide temperature ePaper display (black and white) is the only suitable option.
- If having a Multi-color display is not essential, we recommend selecting Monochrome Display.
- Of course, Good Display can also broaden the operating temperature of ePaper display by adding heating film.

General Guidelines

Guidelines for Safe Handling and Usage of ePaper Display

- Do not press the IC area or the FPC-to-glass bonding area with your hands, as this can easily cause IC damage from static discharge or FPC detachment.
- The FPC is bonded to the glass edge by only 1mm. When handling the ePaper display, please hold it by the glass part and do not lift the product by grabbing the FPC, and FPC is not allowed to be bend upward.
- Please turn off the power before plugging or unplugging the ePaper display, as failure to do so can easily cause IC damage.
- Please check power supply capacity of battery. Weak power capacity will also burn out the IC.
- Always use devices within the rated voltage and current limitations. Powering beyond these specifications will result in irreparable damage.
- Always follow ESD-safe handling techniques. Be sure to ground the human body and electric appliances during work. Preferably, use a conductive mat on the table & wear conduction processed fiber. Synthetic fiber is not recommended. To reduce the generation of static electricity, be sure the operating environment air is not too dry. (50 - 60% relative humidity recommended).
- Inspect products before use to ensure it meets pre-specified quality standards. **DO NOT** remove our manufacturer's plastic liners If the product does not meet our quality standards or it's defective.
- Wear gloves or finger cots to prevent electrical contacts or glass surface contamination.
- Always follow proper soldering techniques and ventilation requirements.



Handling and Operation Precautions for ePaper display

Assembly Guidelines for ePaper Displays

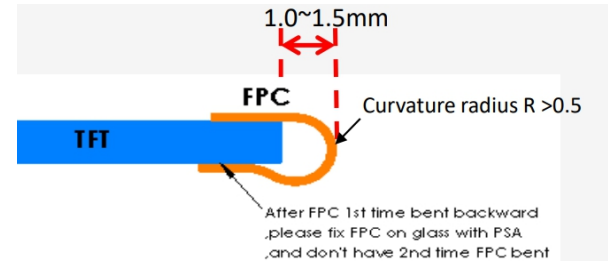
- **Maintain Temperature:** Ensure assembly environment remains within $23\pm 3^{\circ}\text{C}$.
- **Protective Film Removal:** Prior to assembly, remove the protective film from ePaper display.
- **Handle with Care:** ePaper display products are delicate; avoid applying excessive pressure during assembly.
- **Static Electricity Precautions:** ePaper display ICs are sensitive to static electricity. Implement strict measures to prevent static discharge during assembly, operation and storage. Keep ESD below $\pm 200\text{V}$.
- **Control Humidity:** Maintain humidity levels within $55\pm 10\% \text{RH}$.
- **ACF Bonding:** To save installation space and costs, some displays use ACF bonding techniques. Limit loads to less than 1 Kg to avoid damaging bonds and electrical disconnects.



Handling and Operation Precautions for ePaper display

Operation Conditions and Design Notices

- **Sunlight Exposure:** Avoid exposing the ePaper display to direct sunlight as it can potentially damage the film.
- **Strict Compliance with Specifications:** When designing the driving circuit, adhere strictly to the provided specifications. The use of components that do not meet these specifications may shorten the lifespan of the ePaper display.
- **Update Intervals:**
 - Although the refresh rate of monochrome e-paper displays is faster than that of color e-paper, we still recommend allowing at least a 180-second interval after completing a set of display updates. Frequent updates can negatively impact the lifespan of the ePaper.
 - For Multi-color ePaper displays and Full color ePaper displays ePaper displays, it is advisable to perform a full update at least once every 24 hours.
- **Partial update:** After every 5 partial updates, perform a full update on the ePaper display to prevent ghosting on the screen.
- **Deep Sleep Mode:** If the interval between two updates is relatively long, it is recommended to cut off the power supply or set the ePaper display into deep sleep mode to conserve power and prolong its lifespan.
- **FPC Bending Position:** The bending position of the FPC should be about 1.0 to 1.5 mm away from the glass edge and Curvature radius $R > 0.5$, Flexing other parts of the FPC is not permitted.



Operation Precautions for Flexible ePaper Display

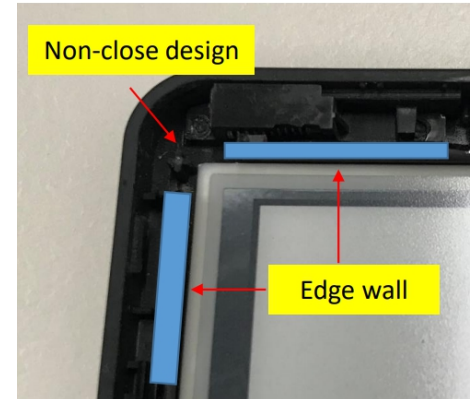
- The IC (integrated circuit) and its surrounding areas are not flexible, so they should not be bent.
- When handling flexible display screens, use gentle methods like suction cups whenever possible.
- Both the front and back of the ePaper display screen should be free from granular foreign objects.
- Operating and storage temperatures should not exceed 70°C, as this could damage the display screen.
- The main advantages of current flexible electronic paper displays are that they are lightweight, space-saving, and less prone to breaking. However, we do not recommend using them in curved areas currently, as this increases the risk of damage.



Designing the End-Customer Product

Product Design Considerations

- **3D Files:** When available, use Good Display provided 3D files for optimal design.
- **Flex Cable (FPC) Handling:**
 - Ensure adequate slack for proper FPC insertion and routing. Avoid tight positioning of flex cables to prevent tension and reliability issues.
 - The bending position of the FPC should be about 1.0 to 1.5 mm away from the glass edge. Creased FPCs indicate improper handling.
- **Display Handling:**
 - Avoid contamination of the “golden finger” area on flex cables; keep fingers clean to prevent hand-oil contamination.
 - Never apply pressure to the glass area of the display, Avoid uneven torques when mounting displays within product housings to prevent glass breakage.
 - In order to prevent EPD cracked from housing corner during drop, it's recommend to preserve space for housing corner. Customer can use a extended or none-close design.



Designing the End-Customer Product

Assembly Guidelines

- **Flex Cable Insertion:**
 - Use MOLEX original connectors to ensure reliable electrical connections.
 - Insert FPC cables into connectors squarely without causing buckling. Lock connectors using tabs on both sides.
 - Inspect after insertion to confirm proper assembly. If issues occur, remove, re-insert, and re-test the cable.
 - Apply Kapton tape slightly overlapping the connector and flex cable to prevent long-term separation.
- **Connector Handling:**
 - Never remove flex cables without unlocking the holding tabs. Avoid violent removal to prevent damage to the golden fingers.



Unlocking the holding tabs



Locking the holding tabs

Designing the End-Customer Product

Handling Precautions

- **Hot-Swaps:**
Never insert or remove displays while the device is powered on to prevent corruption or degradation.
- **Flex Cable Routing:**
Ensure edge clearance when routing flex cables through housing openings to prevent damage from rubbing.
- **Stiffening Tapes:**
Avoid applying stiffening tapes like non-conductive Kapton to flex cables, as stress may lead to tearing, rendering the cable defective.



Guidance for Touch Screen



- Most capacitive touch panels are attached to the displays around the edge perimeters. It's crucial never to attempt to separate these assemblies.
- The presence of small air bubbles around the edges or corners of optically bonded panels indicates uneven forces being applied to the product. These forces can cause the panel to separate from the display, leading to bubble formations in the glass.
- Avoid applying chemicals to capacitive touch panel (CTP) surfaces, as this can result in long-term degradation. Cleaning should only be done with a dry, lint-free cloth.
- Ensure that only the intended stylus is used for the touch panel. Super-sharp stylus tips can damage the finish. Providing a proper stylus for end-users can help prevent damage.
- Avoid applying excessive force to the touch panels beyond what is normally expected. Excessive force for recognition purposes may indicate a touch panel failure.
- When using fingers for actuation, ensure hands are clean to prevent excessive oils or particles from interfering with recognition. Wet or dirty fingers may not be properly recognized by the touch panels.

Storage Guidelines for ePaper Displays

- **Temperature and Humidity:**

Maintain a controlled environment with a temperature range of $23\pm 3^{\circ}\text{C}$ and a humidity range of $55\pm 10\%RH$ for optimal storage conditions.

- **Orientation:**

Store the ePaper display with the front facing up and flat, displaying a white pattern. This orientation helps prevent inerascable ghosting from occurring.

- **Prompt Utilization:**

To ensure the quality of the ePaper display, it is recommended to use it as soon as possible after unpacking. This helps minimize the potential effects of prolonged storage.



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We are so happy to help you.