Application Note —

SXGA Microdisplay Handling Guide (Low Volume)

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1 Introduction

The SXGA miniature colour Liquid Crystal Display (LCD) displays full colour computer or video graphics images with a spatial resolution of 1280 × 1024 pixels on a 20.3mm × 18.5mm reflection mode silicon die (Active Area 17.43 × 13.95mm) microdisplay. The microdisplay concept allows for simple positioning of the high-resolution display in applications as diverse as digital projector systems and head mount displays (HMD), whilst providing up to 24 bit colour depth and full-motion video.

1.1 Purpose

The document describes guidelines to handle the CRL Opto SXGA display.

1.2 Document Scope

These guidelines are intended to supply information to customers to enable use of the CRL Opto microdisplays without causing any degradation in performance of the product. The document covers all aspects of handling the microdisplays. The main reference throughout the document is to the short flexible circuit version known as the M49. It is equally applicable to the longer version of the flexible circuit known as the M37. This document should be used in conjunction with CRL Opto SXGA Microdisplay Version M37 Specification or CRL Opto SXGA Microdisplay Version M49 Specification.

1.3 Disclaimer

It is CRL Opto Limited policy to continually develop this product. The information contained in this document may change without notice.

2 General Precautions

The microdisplays are sophisticated electro optic components and should be treated with appropriate care.

2.1 Anti-Static Precautions

The Microdisplays are static sensitive. The microdisplays should be unpacked and handled only at a static protected work station. Any automated handling of the displays should be carried out using appropriate static dissipative tooling on grounded equipment. Normal static precautions should be observed at all times when handling these components.

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2.2 Cleanliness

The microdisplays are high-resolution optical components. The displays are manufactured in a clean environment. They are packaged and supplied in a manner to keep the parts clean through the delivery process. It is always preferable to keep optical components clean rather than to have to remove contamination later. It is important to keep the microdisplays clean in use, as very small levels of contamination on the front surface of the display can impact the performance of the display within an application. A peelable foil is applied to the front face of each display to keep it clean. Leave this foil in place until such time as the display is to be used.

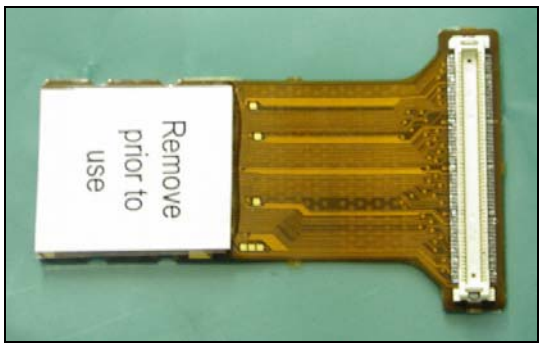

Figure 1 Microdisplay component with peelable foil attached

If cleaning is required then carrying out the following recommended procedure will ensure the best results with the least risk of damage to the display.

2.2.1 Materials

Isopropyl Alcohol (IPA) Assay $\geq$ 99% and de-ionised water mixtures (50:50 or proprietary mix).

Lens tissue or lint free cloth.

2.2.2 Method

Important: Do not apply pressure to glass face.

2.2.2.1 Dry particulate on the front glass

- Remove loose particulate materials from the front glass of the microdisplay by using a low-pressure dry air duster, Figure 2.

- Soft art brushes may also be used to remove dry particulate material. The use of canned air dusters is not recommended as the pressure from these cans can be sufficient to cause shock damage to the microdisplays. They also tend to eject liquid propellant that can leave deposits on the front glass.

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2.2.2.2 Adhered particulate on the front glass

- Lay lens tissue over glass Figure 3
- Drip IPA onto lens tissue till wet but not overly soaked
- Drag lens tissue off glass maintaining contact for as long as possible
- Allow to dry in air or use low pressure nitrogen blow off
- Repeat as necessary

Figure 2 Manual Airbrush

2.2.3 Warnings

Only use recommended materials for cleaning. The use of more aggressive solvents will damage parts of the microdisplay. Particularly vulnerable parts are the bond wire encapsulant and the front electrode connection adhesive.

2.3 Impact

The microdisplays are constructed from various fragile materials including glass, soft plastics and thin foils. While the display assemblies are robust to vibration, shock, thermal shock and pressure in a global parameter, they are sensitive to point loading and bending stresses. Such forces should be avoided. The microdisplay should be designed into a system with consideration to avoid any holders or fixing units from clashing with the display assembly or transmitting any bending moments or torsion onto the display.

2.4 Temperature

The display is rated to 0°C to 60°C. The display may be damaged if a localised area is subjected to a differential in temperature. For optimum performance the microdisplay temperature must be maintained within operating limits. There are three temperature options which have the following optimum operation ranges:

Designation	Optimum operating temperature range
L	25 to 45˚C
C	45 to 58˚C
H	55 to 60˚C

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Higher power optical systems or those for use in more extreme environments may require active thermal management of the microdisplay. The CRL Opto microdisplay dissipates up to 600mW depending on the image data being used and this should be taken into consideration during use.

2.5 Handling

To ensure that the component is not damaged and that it is kept clean the part should only be handled in particular approved ways. It is strongly recommended that the parts are never handled with bare fingers. If the parts are to be manually handled, the use of powder free finger cots is recommended.

Suitable handling locations are the "amber" coloured flex circuit (top and bottom faces) and the steel rigidisers behind the microdisplay and behind the electrical connector. These positions are suitable for either manual handling or for holding with vacuum jigs. The steel rigidiser behind the microdisplay has four indent locations that are designed for secure and repeatable handling. The detail of these is shown on the microdisplay engineering drawing.

At no time should the component be handled on the front glass. Generally the electrical connector, wire bonds & encapsulant, silicon and glass (display) and the conductive adhesive should not be touched.

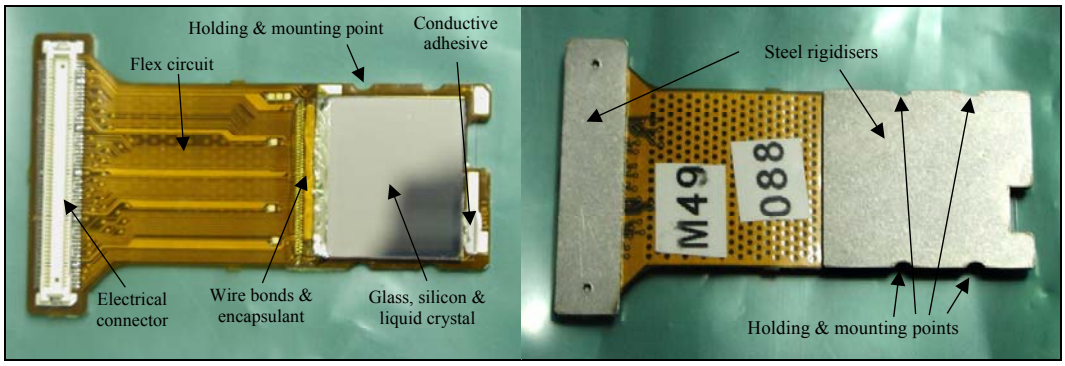

Figure 3 Microdisplay Components

2.6 Mechanical Interface

The microdisplay is designed so that adequate mechanical interface can be made between the microdisplay and the customer application. The key element of this design is the steel rigidiser behind the display. The metal provides mechanical protection from the rear and three sides. The four indents and the rear face allow precise positioning of the microdisplay image plane without excessive size or mass around the display. The indents allow mounting via tooled pin locations or via precision mouldings. The subsequent mounting must be adjustable to the extent required to ensure the location of the image axis within the image plane.

The external face of the microdisplay is coated with a broad band anti-reflection coating designed to minimise reflections at the air glass interface. It is NOT optimised to be optically coupled directly to other optical elements. Mechanical contact must never be made to the silicon, glass wire bond encapsulation or the front electrode material. Mechanical contact should only be made to the back face or sides of the steel rigidiser and the front face of the circuit up to approximately 0.5mm in from the edge in the rigidiser area. The exact design locations are detailed on the microdisplay engineering drawing.

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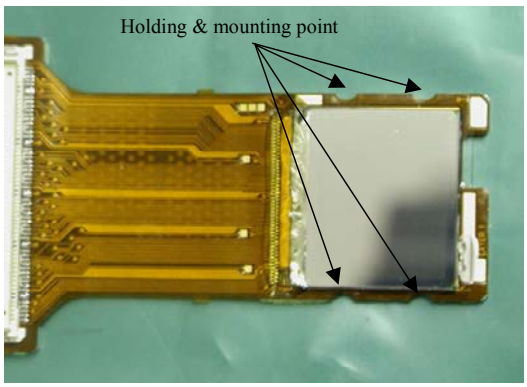

Figure 4 View of the mechanical mounting positions

The CRL Opto Customer Support Team can communicate an example design of a moulded plastic part for the mechanical location of the microdisplay if required. An example of a plastic moulded frame part is shown below

Figure 5 Example of Frame

2.7 Electrical Interface

Important: Always remove power before connecting or disconnecting the display.

The electrical connection to the microdisplay is via a high quality, high-density surface mount connector. The connector incorporates a ground shield to ensure integrity of the high-speed digital signals. Its small size requires that it and the mating half are kept clean and free from debris and contamination to ensure that all connections are reliable. The connector is mechanically polarised but care should be taking to ensure correct alignment. The two halves should be pushed firmly together to ensure that the parts are fully mated.

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3 Contacting CRL Opto

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