

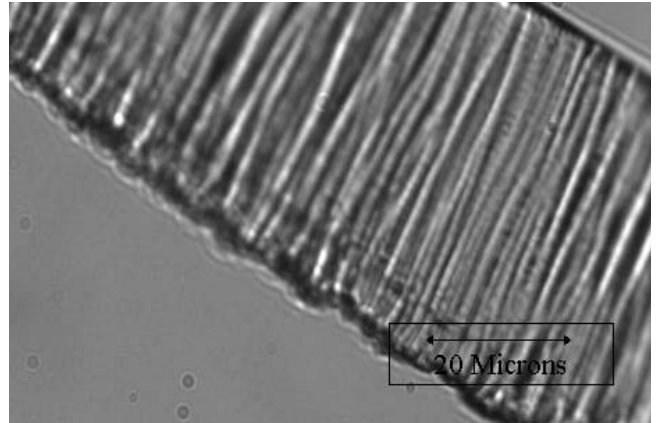


# Microsharp GRIN Diffuser

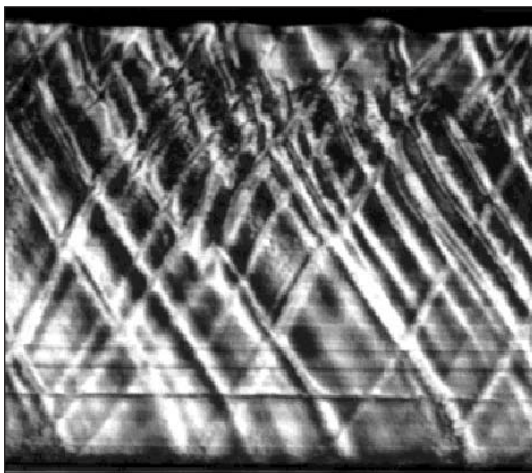
## Light Management Technology

Microsharp has developed a revolutionary internationally-patented graded index optical diffuser film. We have called this film technology “GRIN,” derived from “graded index.”

GRIN films are high performance optical diffuser films in that they are polarization-preserving and have a high transmission. The films permit high resolution without Moiré problems. They enhance contrast and brightness.



The GRIN film thickness is typically about 50  $\mu\text{m}$ . Its total transmittance is typically about 92%.



Polarization maintenance of 98% to 99% can be achieved for laminated GRIN films; 97% to 98% can be achieved for unlaminated GRIN films.

GRIN films seen here in cross-section have a variation in the local refractive index, which gives rise to the contrast seen here in these two images. The geometry of the refractive index variation can be controlled through the manufacturing process.

[www.microsharp.co.uk](http://www.microsharp.co.uk)

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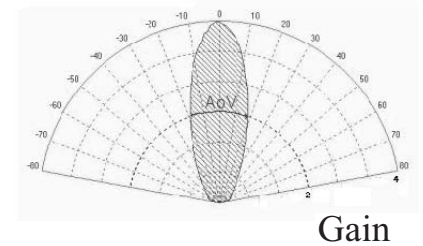
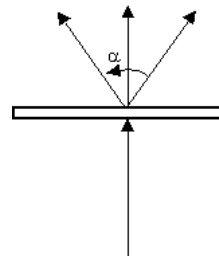


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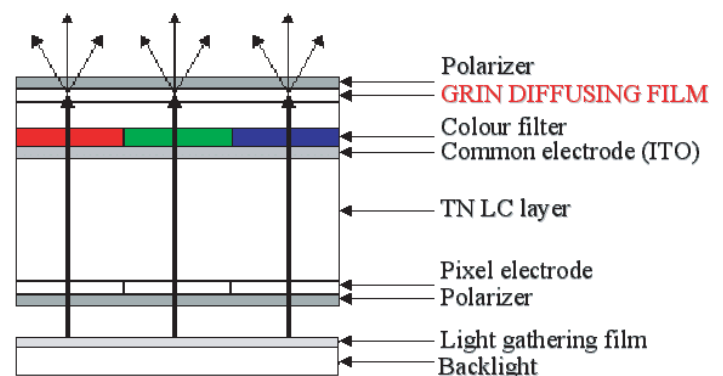
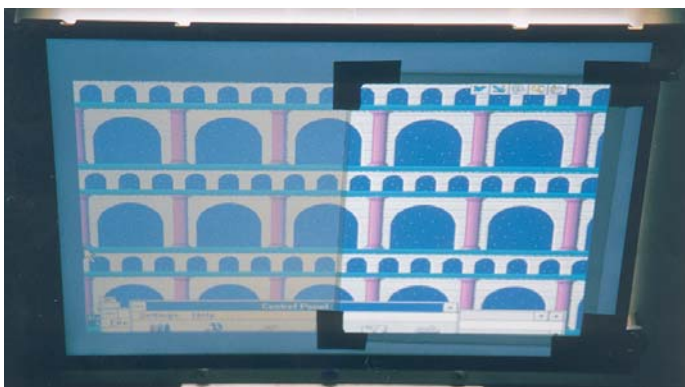
## Product Information

The GRIN film can be included in the backlight, or on top of the LCD stack, depending on the performance characteristics desired.

In the image below, a piece of GRIN has been placed over part of the display, improving image qualities such as contrast and colour fidelity, in this image taken 30 degrees above the horizontal plane.



The GRIN thin film diffuser comes in three varieties: symmetric, asymmetric and off-axis. Symmetric GRIN accepts an incident narrow light beam and outputs a conical distribution with an apex angle  $\alpha$ , as in the figure above. In the case of asymmetric GRIN, the output is a cone with an elliptical cross-section. Off-axis GRIN is intended for illumination by an off-normal light beam. The main application for GRIN is in enhancing the performance of liquid crystal display units, which are otherwise limited in their range of acceptable viewing angles.



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