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3M Display Materials & Systems Division

Application Guide January 2020

3M™ Brightness Enhancement Film (BEF)

Description

The prismatic structure of 3M™ Brightness Enhancement Film (BEF) allows you to manage the angle of light exiting from your display. 3M BEF Films work by utilizing the principles of refraction and total internal reflection. The process of refracting usable light towards the viewer and reflecting most of the remaining light back into the display is called recycling. This form of light management can be done with a single sheet of 3M BEF Film or two sheets crossed at 90 degrees to each other. 3M BEF Films can also be used with 3M Dual Brightness Enhancement Films (DBEF) and 3M Enhanced Specular Reflector (ESR) to further increase the efficiency of your display.

3M™ BEF2-T-155n and BEF4-GT-90 (24) Films - 3M Auto Grade BEF Films. 3M BEF-T-155n film is a non-halogenated acrylic resin prismatic structure coated on a polyester substrate. 3M BEF-T-155n film is the highest performance member of this non-halogenated resin family and incorporates structural features which help avoid wet-out, which is an optical coupling that can mar the appearance of an LCD display.

3M BEF4-GT-90 (24) Film is an even brighter and thinner higher gain resin version with 90 (24) prisms for additional moiré avoidance, thinness, and brightness gain.

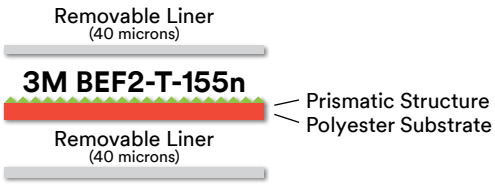
3M™ BEF3-T-155n and BEF3-M2-155n Films - This is a newer 3M Auto Grade BEF Film, featuring similar structural elements to 3M BEF2 Film, but utilizing a randomized prism pattern for increased wet-out and reflective moiré avoidance.

It has just slightly lower gain than 3M BEF2 Film. It is also available in an M2 (Matte) version. The Matte version softens the brightness fall-off at the edges and may allow the elimination of a separate diffuser from the display.

Constructions

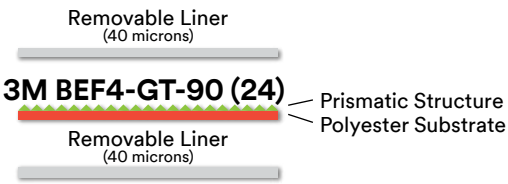
The figures below illustrate the film's basic constructions. All dimensions are approximate, and the figures are not drawn to scale.

3M™ Brightness Enhancement Film BEF2-T-155n



Delivered Thickness	230 microns
Applied Thickness (excluding liners)	150 microns

3M™ Brightness Enhancement Film BEF4-GT-90 (24)

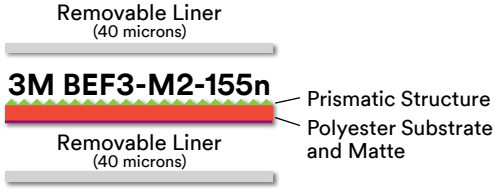


Delivered Thickness	170 microns
Applied Thickness (excluding liners)	90 microns

3M™ Brightness Enhancement Film BEF3-T-155n

Delivered Thickness	235 microns
Applied Thickness (excluding liners)	155 microns

3M™ Brightness Enhancement Film BEF3-M2-155n



Delivered Thickness	234 microns
Applied Thickness (excluding liners)	154 microns

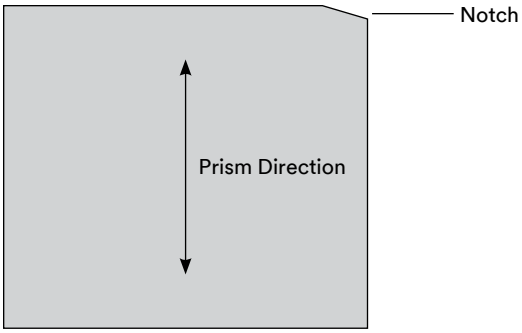
Formats

To help you orient the film, the sheets will have a 70 degree chamfer notch in upper right hand corner. That will be prism side facing you with clear liner side and 70 degree chamfer notch in upper right hand corner.

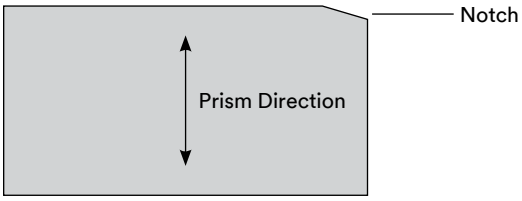
Hold the sheets with the 70 degree chamfer notch in the upper right-hand corner to identify the prism direction in vertical direction as shown below.

Orient the chamfer to the lower right-hand corner to have the prisms run horizontally as illustrated below. When held like this, you will be looking at the upper surface with the prismatic structure, which must face the LC glass module, and away from the backlight. The smooth (non-prism side of film) will have the colored premask. The smooth side of the film will face down toward light guide or light source. Remove premask after cutting to size and installing.

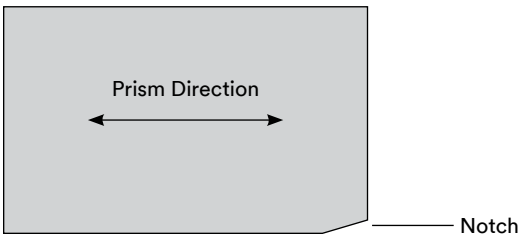
Illustrations are not necessarily drawn to scale, and all dimensions are nominal.



Vertical Prisms



Horizontal Prisms

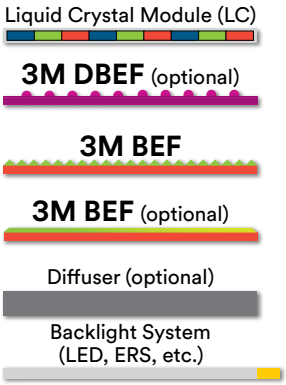


3M™ Brightness Enhancement Film (BEF) family increases on-axis brightness by compressing light into a narrower viewing angle. It is mounted with the prisms running either vertically or horizontally. The compressed viewing angle will be primarily on the plane that is 90 degrees away from the direction of the prisms. In other words, if the prisms are running vertically, the viewing angle will be compressed in the horizontal plane, and with a slight compression in the vertical plane. Likewise, if the prisms are running horizontally, then the viewing angle will be compressed in the vertical plane, with a slight compression in the horizontal plane.

Typical Application

3M BEF Film must always be mounted with the prisms facing the LC module, and away from the backlight. If a second sheet of 3M BEF Film is to be used to gain even greater brightness, its prism direction must be 90 degrees away from the prism direction of the first sheet, and the viewing angle will then be compressed in both the horizontal and vertical planes.

If the display includes 3M DBEF Film for maximum brightness, it should always be mounted on top of the 3M BEF Film, closest to the LC module.



General Converting, Assembly and Handling Recommendations

During converting operations, both the front and rear protective liners should remain on the film. Die cutting is the recommended form of converting and will result in the cleanest edges; shear cutting and laser cutting may also be acceptable. Whatever method used, you should ensure that the part has clean, crisp edges without any raggedness or other damage.

The part should be precisely cut to provide a close fit in the cavity, yet not so close to experience binding or warping problems from thermal expansion.

The part should be left free-floating in the cavity to avoid warping or buckling. If necessary, the part may be tacked down along one edge or two adjacent corners with a double-coated tape, such as Scotch® Double-Coated Tape 415. Designs incorporating mounting tabs, or holes mated to mounting pins, are also popular.

Remove both protective liners, if the film has them, by tacking near an edge or corner with a piece of aggressive tape and pulling gently.

If two pieces of 3M BEF Prismatic Film are to be incorporated, they should be converted with the grooves of the prism structure of the first sheet at a 90-degree angle to the groove direction of the second sheet.

Be aware that handling any polymer film can generate electrostatic charges, which can attract dust and debris.

Remove any loose debris from the film by using compressed air.

Avoid fingerprints and debris by wearing clean latex gloves and holding the product at the edges.

Keep the area very clean to lessen the likelihood of debris contamination. Maintaining class 1000 clean-room conditions is recommended.

Using anti-static measures, such as ionized air blowers whenever possible, is recommended.

As always, protect the film, especially the edges, from any undue shock or stress.

Shelf Life and Storage (prior to application)

Material should be stored in its original packaging, laying in a horizontal orientation, away from direct sunlight. Heavy objects should not be placed on top of it to avoid damaging the product. Ambient temperature and humidity should be controlled to 10–30°C at 35–65% relative humidity.

Availability

For availability, please contact our customer service group at 1-800-553-9215, DMSDcustomerservice@mmm.com. Or visit our website www.3m.com/displayenhancement.

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75-0501-4131-8

dZ **Requester:** Kristin Wincek **Creator:** deZinnia_26674 **File Name:** AppGuide_BEF_75050141318.indd **Structure #:** NA **Date:** 04/21/20	**Printed Colors – Front:** C M Y K **Printed Colors – Back:** C M Y K **Match Colors:**
Scale: 1 Inch	**This artwork has been created as requested by 3M. 3M is responsible for the artwork AS APPROVED and assumes full responsibility for its correctness.**