3M™ Enhanced Specular Reflector (ESR) can also be used in conjunction with BEF and DBEF. BEF, DBEF is available in a variety of configurations that can be useful for specific applications. DBEF increases both brightness and the amount of light available over the entire LCD. Similar to this light would normally be absorbed, and lost, by the rear polarizer of the liquid crystal panel. Light of the wrong polarization is reflected into the backlight.

DBEF is a multilayer, reflective polarizer. This film works to polarize the backlight’s output so that it can transmit through the LCD. Light of the wrong polarization is reflected into the backlight. DBEF can be combined with DBEF and ESR. This provides a variety of options for environmental performance, added benefit of providing additional brightness with its multifunctional design and support for the complete line of film products and the designers, engineers and brands that implement them.

Offering Benefits Critical to the Automotive Industry

3M offers a full line of Display Enhancement products designed to amplify the performance of electronic displays by making them brighter, whiter, and more vivid in color. These products offer versatility and add value to virtually any electronic display application. These films are also present to offer high-efficiency automotive in automotive applications.

ALCF-A Film

ALCF-A Film is a louver film with a 60 degree viewing angle and is available with or without a matte hardcoat. ALCF-P is designed to be used on the outside of an LCD, and can go between the touch panel and the LCD.

ALCF-P film is a louver film with no birefringent polycarbonate substrate. This allows the light to be scattered at the back of a liquid crystal display, in common use to prevent glare from reflective glass surfaces in automobiles. ALCF-A plus 60 degree viewing angle. ALCF-A+ is a louver film combined with a reflective polarizer (DBEF).

ALCF-P film can be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various finishes to meet specific application requirements.

ALCF-A+ Film

ALCF-A+ Film is a louver film combined with a reflective polarizer (DBEF). ALCF-A+ is a louver film with a 60 degree viewing angle. ALCF-A+ can be used as single sheets or as two sheets crossed at 90 degrees to each other. ALCF-A+ can be used as single sheets or as two sheets crossed at 90 degrees to each other.

Beacon Light Control Film (DBEF)

DBEF is a thin film, 100% polymer reflector. ESR is used as single sheets or as two sheets crossed at 90 degrees to each other. This film is designed to make display windows and control brightness. ESR can be combined with DBEF and ESR films for specific applications.

Advanced technology designed to direct and enhance light

Highly intelligent engineering harnesses the full capacity of light, transforming displays to be remarkably brighter, more durable and less reflective.

PROTECTION FILMS

3M™ Protection Films help protect displays against damage that can occur from the rigors of everyday use. Engineered with a thin, low adhesive, the films are easily applied and easy to remove. Available in a variety of thickness to meet specific application requirements.

3M™ Dual Brightness Enhancement Film is a high brightness, high performance film that can be used in conjunction with DBEF and ESR. This film is designed to increase both brightness and the amount of light available over the entire LCD. Similar to this light would normally be absorbed, and lost, by the rear polarizer of the liquid crystal panel. Light of the wrong polarization is reflected into the backlight.

3M™ Advanced Light Control Film (ALCF) is a louver film that can be used to control the distribution of light. ALCF can be used to make display windows, control reflections or improve display contrast.

3M™ Protection Films are a full line of Display Enhancement products designed to amplify the performance of electronic displays by making them brighter, whiter, and more vivid in color. These products offer versatility and add value to virtually any electronic display application. These films are also present to offer high-efficiency automotive in automotive applications.

Light Control Films

3M™ Brightness Enhancement Films (BEF) and 3M™ Enhanced Specular Reflector (ESR) are recycling, light management films that are used to increase the brightness of backlights used in LCDs. The primary goal in adding these films can be to increase brightness in the display or it can be translated to power savings or thermal management. BEF is a prismatic film that manages the angular output of light from the backlight. This film uses refraction to compress the backlight output towards an on-axis viewer. BEF films can be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various finishes to meet specific application requirements.

BEF is a prismatic film that manages the angular output of light from the backlight. This film uses refraction to compress the backlight output towards an on-axis viewer. BEF films can be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various finishes to meet specific application requirements.

3M™ Glossy Protection Film offers a glossy finish to help maintain the finish of a glossy display or instantly upgrade a matte display to high-gloss. Optically clear, adhesive film allows up to 95% transmittance, keeping display brightness with no color distortion.

3M™ Anti-Reflection Multiaxial Conductive Protection Film (ARCF-CC) is an advanced technology for reducing glare and reflections. This film features a near color-neutral anti-reflection surface treatment and anti-glare coating to reduce mirror-like reflections.

3M™ Protection Films are a full line of Display Enhancement products designed to amplify the performance of electronic displays by making them brighter, whiter, and more vivid in color. These products offer versatility and add value to virtually any electronic display application. These films are also present to offer high-efficiency automotive in automotive applications.

Advanced Solutions for Light Enhancement, Control, and Protection

For more information visit our website at www.3m.com/displayenhancement or call 1.800.553.9215

Advanced Solutions

Offering Benefits Critical to the Automotive Industry

3M offers a full line of Display Enhancement products designed to amplify the performance of electronic displays by making them brighter, whiter, and more vivid in color. These products offer versatility and add value to virtually any electronic display application. These films are also present to offer high-efficiency automotive in automotive applications.

ALCF-A, ALCF-P and LCFX notify film to reduce unwanted reflections and glare from automotive displays and instrumentation. ALCF-A+ has the selected benefits of providing additional brightness with the cost-effective design with DBEF. This provides a variety of options for environmental performance, increasing automotive industries and application requirements.

3M™ Display Enhancement and Protection Films

Light Control Films

3M™ Protection Films are a full line of Display Enhancement products designed to amplify the performance of electronic displays by making them brighter, whiter, and more vivid in color. These products offer versatility and add value to virtually any electronic display application. These films are also present to offer high-efficiency automotive in automotive applications.

ALCF-A Film

ALCF-A Film is a louver film with a 60 degree viewing angle. ALCF-A+ has the selected benefits of providing additional brightness with the cost-effective design with DBEF. This provides a variety of options for environmental performance, increasing automotive industries and application requirements.
## Specialty Films

**BRIGHTNESS ENHANCEMENT**

- **Light Control**
- **Front Surface/Protection**

### Glossy LR
- **ALCF-P**
- **ARMR220**

### Polarizer
- **LCD**
- **Polarizer**

### ALCF-A/A+/LCF
- **DBEF**
- **BEF**
- **BEF**
- **Diffuser**
- **Light Guide**
- **ESR**

### Environmental Performance and Specifications

**COLD DRY HEAT**

- **-40°C/500 hours**
- **85°C/500 hours**
- **60°C/90% R.H./500 hours**

**HEAT & HUMIDITY**

- **85°C/1,000 hours**
- **65°C/95% R.H./1,000 hours**

**THERMAL SHOCK**

- **65°C for 1 hour to -40°C for 1 hour, 100 cycles**

### Film Applications

- **Specialty films protect, enhance and control screen performance**

### Environmental Performance and Specifications

<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>TRANSMISSION</th>
<th>KNOB</th>
<th>CLARITY</th>
<th>PANEL HAZE</th>
<th>DRECTION</th>
<th>APPLIED THICKNESS</th>
<th>DRY HEAT</th>
<th>LIGHT &amp; SHOCK</th>
<th>THERMAL SHOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GLR</strong></td>
<td>≥ 93%</td>
<td>≤ 1.6%</td>
<td>≥ 99%</td>
<td>≥ 3H</td>
<td>≤ 1.95%</td>
<td>130 um with adhesive</td>
<td>-40°C for 1,000 hours</td>
<td>85°C for 1,000 hours</td>
<td>85°C for 1,000 hours **</td>
</tr>
<tr>
<td><strong>GLS 100</strong></td>
<td>≥ 90%</td>
<td>≤ 3%</td>
<td>≥ 99%</td>
<td>≥ 4H</td>
<td>N/A</td>
<td>152 um with adhesive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ARMR220</strong></td>
<td>≥ 93%</td>
<td>≤ 3%</td>
<td>≥ 75%</td>
<td>≥ 3H</td>
<td>≤ 1.6%</td>
<td>152 um with adhesive</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Film Applications

- **MILITARY**
  - Aquarium Panels
  - Rugged LCDs
  - Military Panels
  - Instrument Panels
- **FINANCIAL**
  - POS
  - LCD Displays
- **MEDICAL**
  - Medical Record Displays
- **ENTERTAINMENT**
  - Gaming Systems
  - Outdoor Displays
  - Personal Device Displays
- **TRANSPORTATION**
  - Sign-In Stations
  - Information Displays
  - Instrument Panels
- **RETAIL**
  - Signature Capture Kiosks
  - Digital Signage
  - Point of Sale
- **AUTOMOTIVE**
  - Automotive Displays
  - Navigation Systems
  - Rear View Mirrors
  - Entertainment Displays
Advanced technology designed to direct and enhance light

Highly intelligent engineering harnesses the full capacity of light, transforming displays to be remarkably brighter, more durable and less reflective.

PROTECTION FILMS

3M™ Protection Films help protect displays against damage that can occur from the rigors of everyday use. Designed with a low tack adhesive, the films are easy to apply and easy to remove. Available in a variety of thickness to meet specific application requirements.

3M™ Going Prototype Film offers a glossy finish to help maintain the front of a glossy display or to improve graphics in a trade show display to high glass. The film allows light to pass greater than 95% transmission, keeping display bright with no color distortion.

3M™ Advanced Light Control Film (ALCF) is a microlouver film that controls the distribution of light. ALCF-A can be used as an on-axis backlight or can be translated to power savings or thermal management.

3M™ Protection Films help protect displays against damage that can occur from the rigors of everyday use. Designed with a low tack adhesive, the films are easy to apply and easy to remove. Available in a variety of thickness to meet specific application requirements.

3M™ Advanced Light Control Film (ALCF) is a microlouver film that controls the distribution of light. ALCF-A can be used as an on-axis backlight or can be translated to power savings or thermal management.

3M™ 50 Micron (50µm) Polyethylene Terephthalate (PET) Film can be used as a hardcoat on the front of a display or as a hardcoat on the outside of an LCD, and can go between the touch panel and the LCD.

3M™ Protection Films help protect displays against damage that can occur from the rigors of everyday use. Designed with a low tack adhesive, the films are easy to apply and easy to remove. Available in a variety of thickness to meet specific application requirements.

LIGHT CONTROL FILMS

3M™ Advanced Light Control Film (ALCF) is a microlouver film that controls the distribution of light. ALCF-A can be used as an on-axis backlight or can be translated to power savings or thermal management.

3M™ Advanced Light Control Film (ALCF) is a microlouver film that controls the distribution of light. ALCF-A can be used as an on-axis backlight or can be translated to power savings or thermal management.

BRIGHTNESS ENHANCEMENT FILMS

3M™ Brightness Enhancement Films (DBEF) are single sheets or as two sheets crossed at 90 degrees to each other. Available in various configurations, BEF can be customized for specific application needs. BEF can also be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various configurations, BEF can be customized for specific application needs.

3M™ Dual Brightness Enhancement Film (DBEF) can also be used in conjunction with BEF and ESR. DBEF is available in a variety of configurations that can be useful for specific applications.

3M™ Enhanced Special Reflective (ESR) is a thin, 100% polyester reflective film used as the backlight reflector for LCDs. The film provides cut-through reflection, across the entire visible spectrum to maximize the recycling efficiency of LCD backlights. ESR can be combined with BEF and DBEF films for specific applications.
Environmental Performance and Specifications

### Environmental Performance and Specifications

<table>
<thead>
<tr>
<th>PRODUCTS</th>
<th>TRANSMISSION</th>
<th>Haze</th>
<th>Clarity</th>
<th>Panel Protection</th>
<th>Applied Thickness</th>
<th>COL2</th>
<th>DRY HEAT</th>
<th>LIGHT &amp; SHOCK</th>
<th>THERMAL SHOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALCF-P</td>
<td>≥ 90%</td>
<td>≤ 1.0%</td>
<td>≤ 1.0%</td>
<td>≥ 98%</td>
<td>≥ 98%</td>
<td>0%</td>
<td>≤ 6%</td>
<td>≤ 1.0%</td>
<td>65°C/85% R.H.</td>
</tr>
<tr>
<td>ARMR220</td>
<td>≥ 90%</td>
<td>≤ 1.0%</td>
<td>≤ 1.0%</td>
<td>≥ 98%</td>
<td>≥ 98%</td>
<td>0%</td>
<td>≤ 6%</td>
<td>≤ 1.0%</td>
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</tr>
</tbody>
</table>

**Film Applications**

- **Specialty films** protect, enhance and control screen performance.
- **Environmental Performance and Specifications**

- **COLD DRY HEAT**
  - 85°C/500 hours
  - 60°C/90% R.H./500 hours **

- **HEAT & HUMIDITY**
  - 95°C/500 hours
  - 85°C/500 hours
  - 65°C/90% R.H./500 hours **

- **THERMAL SHOCK**
  - One hour at -40°C followed by one hour at +95°C
  - One hour at -40°C followed by one hour at +85°C

**PRODUCTS**

- **LOUVER FILMS**
  - ALCF-P(1) with adhesive: 482 μm
  - ALCF-P ABR0/ABR2: 389 μm
  - ALCF-A/A+/LCF: 380 μm
  - ALCF-A+: 490 μm
  - LCF PlusII: 730 μm
  - LCF PC100K: 450 μm
  - LCF PC200K: 650 μm

- **PRISM FILMS**
  - BEF II 90/24: 140 μm
  - BEF II 90/50: 150 μm
  - BEF3-T-155: 155 μm
  - BEF III 90/50 Matte: 160 μm
  - BEF III 90/50 10T: 278 μm
  - IDF: 155 μm
  - TRAF II: 155 μm

- **REFLECTIVE POLARIZERS**
  - DBEF-D2-400: 395 μm
  - DBEF-D2-280: 280 μm
  - DBEF-Q with adhesive: 138 μm
  - DBEF II: 150 μm
  - DBEF-E: 132 μm
  - DBEF-Q: 113 μm

- **REFLECTOR**
  - ESR: 66 μm

**APPLICATIONS**

- **MILITARY**
  - MILITARY PANELS
  - MILITARY PANS
  - MILITARY PURSUIT PANELS

- **FINANCIAL**
  - LCD DISPLAYS

- **MEDICAL**
  - MEDICAL RECORD DISPLAYS

- **ENTERTAINMENT**
  - GAMING STATIONS
  - DIGITAL DISPLAYS

- **TRANSPORTATION**
  - CHECK-IN STATIONS
  - INFORMATION BOARDS

- **RETAIL**
  - SIGNATURE CAPTURES
  - DIGITAL SIGNS
  - POINT OF SALE

- **AUTOMOTIVE**
  - AUTOMOTIVE DISPLAYS
  - NAVIGATION SYSTEMS
  - REAR VIEW MIRRORS

**PRODUCT PROTECTION FILMS**

- **GLR**
  - (Glossy Low Reflection) ≥ 93% ≤ 1.6% ≥ 99% ≥ 3H ≤ 1.95% 130 μm with adhesive

- **GLS 100**
  - (Glossy Protection) ≥ 90% ≤ 3% ≥ 99% ≥ 4H N/A 152 μm with adhesive

- **ARMR220 Protection**
  - ≥ 93% ≤ 3% ≥ 75% ≥ 3H ≤ 1.6% 152 μm with adhesive

**Environmental Performance and Specifications**

- **COLD DRY HEAT**
  - 85°C/500 hours
  - 60°C/90% R.H./500 hours **

- **HEAT & HUMIDITY**
  - 95°C/500 hours
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**PRODUCT PROTECTION FILMS**

- **GLR**
  - (Glossy Low Reflection) ≥ 93% ≤ 1.6% ≥ 99% ≥ 3H ≤ 1.95% 130 μm with adhesive

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- **ARMR220 Protection**
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**Environmental Performance and Specifications**

- **COLD DRY HEAT**
  - 85°C/500 hours
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  - 95°C/500 hours
  - 85°C/500 hours
  - 65°C/90% R.H./500 hours **

- **THERMAL SHOCK**
  - One hour at -40°C followed by one hour at +95°C
  - One hour at -40°C followed by one hour at +85°C

**PRODUCTS**

- **LOUVER FILMS**
  - ALCF-P(1) with adhesive: 482 μm
  - ALCF-P ABR0/ABR2: 389 μm
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  - ESR: 66 μm
PROTECTION FILMS

3M™ Protection Films help protect displays against damage that can occur from the rigors of everyday use. Designed with a thin back adhesive, these films are easy to apply and easy to remove. Available in a variety of thickness to meet specific application requirements.

LIGHT CONTROL FILMS

3M™ Advanced Light Control Film (ALCF) is a multilayer, reflective polarizer film that can be used to increase the brightness, contrast and control reflections on display control. ALCF uses refraction to compress the backlight output towards an on-axis viewer. This film works to polarize the backlight's output so that light would normally be absorbed, and lost, by the rear polarizer of the liquid crystal panel. ALCF can be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various finishes to meet specific application requirements.

BRIGHTNESS ENHANCEMENT FILMS

3M™ Brightness Enhancement Film (DBEF) is a multilayer, reflective polarizer. This film works to polarize the backlight's output so that light would normally be absorbed, and lost, by the rear polarizer of the liquid crystal panel. DBEF is a film that offers a combination of brightness enhancement and ambient light management. Optically clear, this film allows up to 65% transmission, keeping display brightness high with no color distortion.

3M™ Anti-Reflection Multilayer Conductive Protection Film (AR8H200 NC) is an advanced protection film that helps minimize reflections and glare. Features a near coat coated with reflective surface treatment and an anti glass coating to reduce mirror like reflections.

OFFERING BENEFITS CRITICAL TO THE AUTOMOTIVE INDUSTRY

3M™ offers a line of Display Enhancement products designed to amplify the performance of electronic Displays by making them brighter, whiter, less reflective and more visible. These products offer versatility and add value to virtually any electronic display applications. These films are also present to offer higher reflective luminance in automotive applications.

3M™ Protection Films help protect displays against damage that can occur from the rigors of everyday use. Designed with a thin back adhesive, these films are easy to apply and easy to remove. Available in a variety of thickness to meet specific application requirements.

3M™ Enhanced Specular Reflector (ESR) is a thin film, 100% polymer reflector that is used as the backlight reflector for LCDs. This film provides >98% reflectance, across the entire visible spectrum, to maximize the recycling efficiency of LCD backlights. ESR can be combined with DBEF and ESR films for specific applications.

3M™ Anti-Reflection Multilayer Conductive Protection Film (AR8H200 NC) is an advanced protection film that helps minimize reflections and glare. Features a near coat coated with reflective surface treatment and an anti glass coating to reduce mirror like reflections.

3M™ Brightness Enhancement Film (DBEF) is a multilayer, reflective polarizer film that can be used to increase the brightness, contrast and control reflections on display control. ALCF uses refraction to compress the backlight output towards an on-axis viewer. This film works to polarize the backlight's output so that light would normally be absorbed, and lost, by the rear polarizer of the liquid crystal panel. ALCF can be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various finishes to meet specific application requirements.

BRIGHTNESS ENHANCEMENT FILMS

3M™ Brightness Enhancement Film (DBEF) and 3M™ Commercial Brightness Enhancement Film (CBEF) are recycling light management films that are used to increase the brightness of backlights used in LCDs. These films can be used as single sheets or as two sheets crossed at 90 degrees to each other. Available in various configurations, CBEF can be customized for specific applications needs. DBEF can be used in conjunction with DBEF and CBEF.

CBEF is a multilayer, reflective polarizer. The film works to reduce the brightness of the backlight, reducing the amount of light that is reflected off the display. This film uses an advanced coating technology to control the distribution of light. CBEF redirect light to reduce unwanted reflections off glass surfaces in automobiles. ALCF-A has a 60 degree viewing angle. ALCF-An is a louver film combined with a reflective polarizer (DBEF).

3M™ Anti-Reflection Multilayer Conductive Protection Film (AR8H200 NC) is an advanced protection film that helps minimize reflections and glare. Features a near coat coated with reflective surface treatment and an anti glass coating to reduce mirror like reflections.

ALCF is a film that manages the angular output of light from the backlight. This film uses refraction to compress the backlight output towards an on-axis viewer. DBEF can be combined with the use of LCDs and CRTs. ALCF can be combined with the use of LCDs and CRTs. ALCF can be combined with the use of LCDs and CRTs. ALCF can be combined with the use of LCDs and CRTs.

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