

# 3M™ Contrast Enhancement Film

## CEF28XX (8148-X) Series

- Excellent durability in reliability testing
- High conformability to surfaces steps
- Superior mura resistance

### Product Description

3M™ Contrast Enhancement Films (CEF) are specialized optically clear adhesives offering excellent clarity and adhesion to various transparent display substrates. 3M CEF28XX is designed for applications that require soft CEF for filling thick ink step (lens border frame), ITO compatibility and high adhesion. 3M CEF28XX is UV curable which makes it suitable for film touch panel and LCM bonding applications.



### Construction

| Product                | 3M CEF2801<br>(8148-1)  | 3M CEF2802<br>(8148-2)  | 3M CEF2803<br>(8148-3)  | 3M CEF2804<br>(8148-4)  | 3M CEF2805<br>(8148-5)  |
|------------------------|---|---|---|---|---|
| Adhesive Type:         | Acrylic   | Acrylic   | Acrylic   | Acrylic   | Acrylic   |
| Adhesive Carrier:      | None  | None  | None  | None  | None  |
| Approximate Thickness: |   |   |   |   |   |
| Release Liner:         | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          |
| Adhesive:              | 25 um<br>(1.0 mil)  | 50 um<br>(2.0 mils)   | 75 um<br>(3.0 mils)   | 100 um<br>(4.0 mils)  | 125 um<br>(5.0 mils)  |
| Release Liner:         | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester |

The 3M family of optically clear adhesives for electronic displays are usually available in two forms. 3M OCA come in roll good form. 3M Contrast Enhancement Films (CEF) are available in die-cut form.

| Product                | 3M CEF2806<br>(8148-6)  | 3M CEF2807<br>(8148-7)  | 3M CEF2808<br>(8148-8)  | 3M CEF2810<br>(8148-10)   | 3M CEF2814<br>(8148-14)   |
|------------------------|---|---|---|---|---|
| Adhesive Type:         | Acrylic   | Acrylic   | Acrylic   | Acrylic   | Acrylic   |
| Adhesive Carrier:      | None  | None  | None  | None  | None  |
| Approximate Thickness: |   |   |   |   |   |
| Release Liner:         | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          | 50 um<br>(2.0 mils)<br>Clear Polyester                          |
| Adhesive:              | 150 um<br>(6.0 mils)  | 175 um<br>(7.0 mils)  | 200 um<br>(8.0 mils)  | 250 um<br>(10.0 mils)   | 350 um<br>(14.0 mils)   |
| Release Liner:         | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester | 75, 100 or 125 um<br>(3.0, 4.0, or 5.0 mils)<br>Clear Polyester |

## Typical Physical Properties and Performance Characteristics

**Note:** The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

### Performance to Environmental Conditions:

The following environmental tests were conducted in the 3M laboratory under the conditions specified without any appreciable deterioration in visible appearance (no bubbles, delamination, etc.). Sample construction is cover glass/3M CEF28/ hard-coated polarizer.

|                      | Condition  | Duration   |
|----------------------|--|------------|
| High Temperature     | +95°C  | 1000 hours |
| Low Temperature      | -40°C  | 1000 hours |
| High Temp/Humidity-1 | +65°C/90%RH                                      | 1000 hours |
| High Temp/Humidity-2 | +85°C/85%RH                                      | 1000 hours |
| Thermal Shock        | -40°C and +85°C (1 hour dwell, <1 min ramp time) | 300 cycles |
| UV                   | .55 W/m <sup>2</sup> at 340nm, Daylight filter   | 500 hours  |

### Peel Adhesion:

ASTM D3330 modified, 180 degree peel from glass, 1 cm wide peel strips, 12 in/min (305 mm/min), 2.0 mil polyester backing, 3M CEF28XX cured 3J/cm<sup>2</sup>

| Peel Adhesion to Glass |                            |                            |
|------------------------|----------------------------|----------------------------|
| Dwell Time             | 20 min dwell at 25°C/50%RH | 3 days dwell at 25°C/50%RH |
| Units                  | N/cm                       | N/cm                       |
| 3M CEF2802 (8148-2)    | 7.1                        | 11.1                       |
| 3M CEF2806 (8148-6)    | 9.0                        | 14.5                       |
| 3M CEF2810 (8148-10)   | 9.9                        | 15.8                       |
| 3M CEF2814 (8148-14)   | 14.3                       | 16.0                       |

## Color:

Ultra Scan Pro (Hunter Lab), ASTM E308, D65/10°  
3M CEF28XX on LCD glass, uncured

| 3M CEF2802 (8148-2) | 3M CEF2806 (8148-6) | 3M CEF2810 (8148-10) | 3M CEF2814 (8148-14) |
|---------------------|---------------------|----------------------|----------------------|
| L* = 97.0           | L* = 96.9           | L* = 97.0            | L* = 96.9            |
| a* = -0.01          | a* = 0.00           | a* = 0.00            | a* = -0.23           |
| b* = 0.15           | b* = 0.17           | b* = 0.20            | b* = 0.26            |

## Refractive Index:

(+ 0.0005 Metricon measurements)

| 3M CEF28XX (8148-X) |        |        |        |
|---------------------|--------|--------|--------|
|                     | 405 nm | 532 nm | 633 nm |
| Uncured             | 1.4879 | 1.4765 | 1.4717 |
| Cured               | 1.4903 | 1.4783 | 1.4735 |

## Haze:

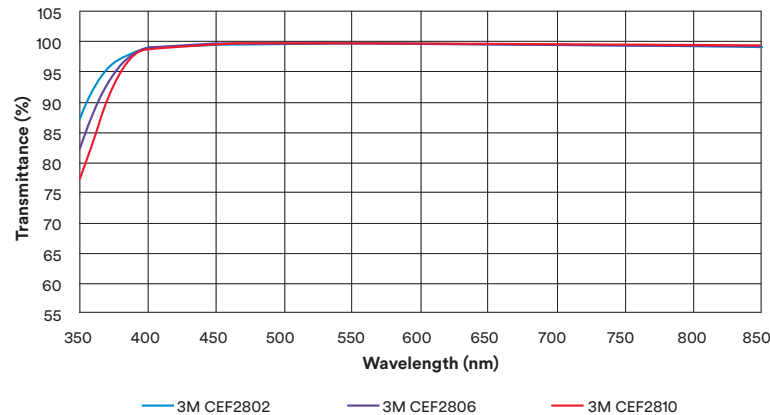
Haze is measured according to ASTM D1003-92,  
3M CEF28XX on LCD glass, uncured

| 3M CEF2802 (8148-2) | 3M CEF2806 (8148-6) | 3M CEF2810 (8148-10) | 3M CEF2814 (8148-14) |
|---------------------|---------------------|----------------------|----------------------|
| 0.1%                | 0.1%                | 0.2%                 | 0.2%                 |

## Transmission Curve:

3M™ Contrast Enhancement Film CEF28XX

Uncorrected Transmission vs. Wavelength (Corrected for  
Reflection Loss of LCD) for 3M™ CEF28XX on Glass



## Typical Electrical Properties at Room Temperature:

ASTM-D150-92. 3M CEF28XX cured 3J/cm<sup>2</sup>

## Dielectric Constant:

| 3M CEF28XX (8148-X) |                     |
|---------------------|---------------------|
| Frequency (kHz)     | Dielectric Constant |
| 100                 | 4.2                 |
| 500                 | 3.9                 |

## Suggested Lamination Process

Step 1: Remove secondary liner, and then laminate 3M CEF28XX to first adherent substrate by roller at room temperature

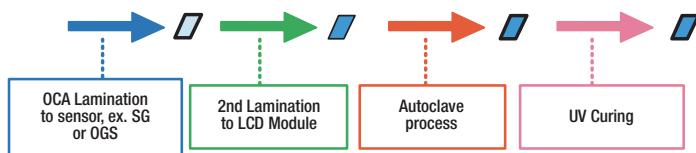
Recommendation: roller pressure 0.1 – 0.2 MPa, roller speed 0.5 – 1 m/min

Step 2: Remove primary liner, and then laminate 3M CEF28XX/first adherent to second adherent by vacuum lamination (if rigid-to-rigid bonding)

Recommendation: Vacuum condition < 50 Pa, pressure around 0.1 – 0.2 MPa

Step 3: Autoclave process recommendation: 30-60°C/3-5kgf/cm<sup>2</sup>/20-30min

Step 4: UV curing with minimum 3J/cm<sup>2</sup> dosage



## UV Cure Guidance

- UV range: 340-375nm (max absorption = 342nm)
- Minimum UV dosage and intensity: 3 J/cm<sup>2</sup>, 10 mW/cm<sup>2</sup>
- Suggest using lower wavelengths of the UV-A spectra. Suitable UV sources would be Fusion D bulb and medium pressure Hg.
- LED sources, which output at longer UV-A wavelengths would be less ideal.

## Storage

- Avoid applying pressure or resting objects on the product to prevent marking, denting, or deforming the surface.
- Wear gloves to prevent fingerprints or nail marks when handling.
- Product needs to be unpacked and handled in a clean-room facility.
- Product must be protected from light exposure.
- Store in sealed, foil bag under -20°C to 30°C and less than 70% relative humidity. If removed from cold storage, ensure no condensation on packaging.



### 3M Display Materials & Systems Division

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## Regulatory

For regulatory information about this product, please contact your 3M representative.

## Technical Information

The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes reliable, but the accuracy or completeness of such information is not guaranteed.

## Product Use

Many factors beyond 3M's control and uniquely within the user's knowledge and control can affect the use and performance of a 3M product in a particular application. Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for determining if the product is fit for a particular purpose and suitable for user's method of application.

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