

3M™ Ultra-Clear Solar Film (UCSF)

Product Description

3M Ultra-Clear Solar Film (UCSF) is a non-metallic multi-layer optical film that reflects infrared solar energy with minimal effect on visible light transmission. 3M Ultra-Clear Solar Film is used in automotive laminated glass, sandwiched between two layers of glass and PVB. 3M Ultra-Clear Solar Film is neutral in color and therefore can be used with a wide variety of tinted or reflective glasses.

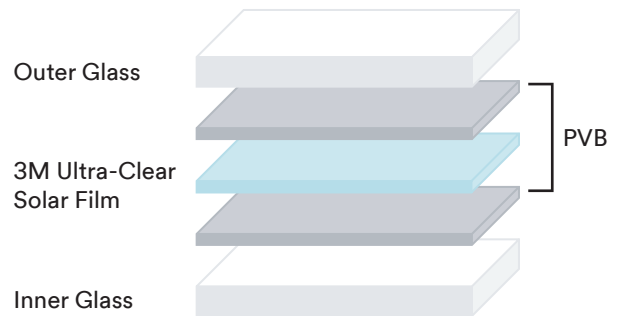
- High visible light transmission (< 2% reduction in VLT compared to laminates without film)
- Neutral color ($a^* = 0.25$; $b^* = -3.75$)
- Low solar energy absorption
- Low visible light reflection (changes R_{vis} by < 2% compared to laminates without film)
- Non metallic (will not corrode on exposed edges)
- No radio frequency interference (< 5 dB attenuation --- in range of 100 – 4500 MHz)
- Enhanced solar performance with minimal color shift, even at steep viewing angles

Construction

3M Ultra-Clear Solar Film (UCSF) uses multilayer optical film technology, over 200 microlayers that reflect infrared heat while allowing visible light to pass through. UCSF can be used in laminated windshields, sunroofs, sidelights and backlights to create comfortable automotive interiors.

How is it used?

3M Ultra-Clear Solar Film is easily laminated between sheets of PVB. It's conformable for bent glass applications and works with most different glass and PVB combinations.



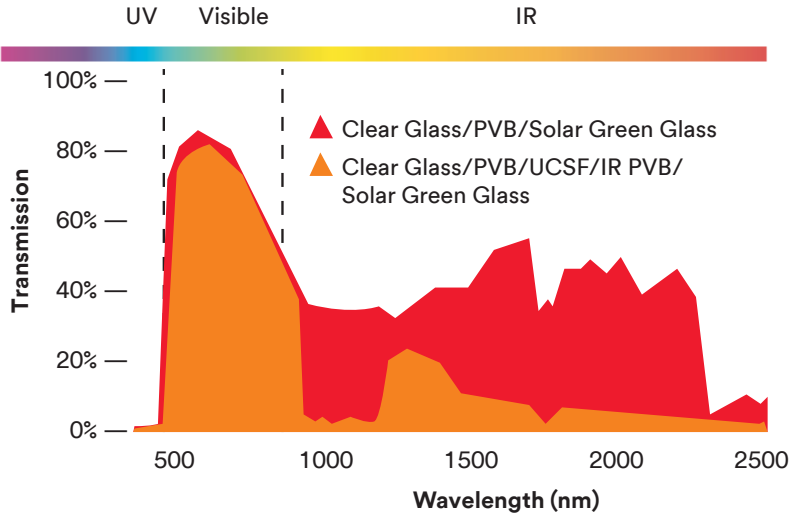
Typical Physical Film Properties:

Nominal shrinkage % (15 min. @ 150°C)	Machine direction	Cross-web direction
		2.8
Nominal thickness:	50.0 microns (2.0 mils)	

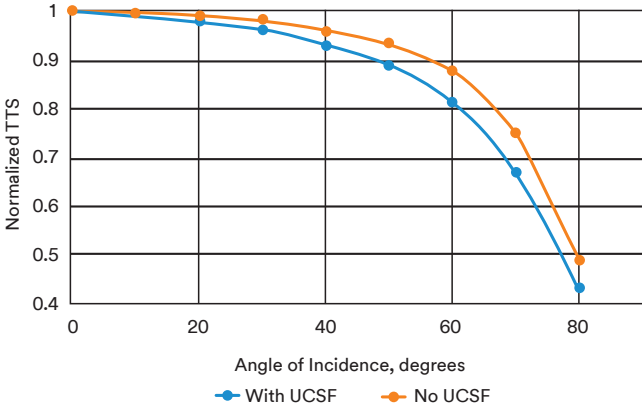
Performance Metrics

Solar performance of laminated automotive glass

	Tvis	Rvis	Tsol	Rsol	Asol	Tts
Clear glass/Solar green glass	81.9%	8.4%	55.3%	6.5%	38.2%	0.668
with UCSF	79.7%	10.6%	47.1%	22.6%	30.3%	0.562
with UCSF and IR absorbing PVB	78.8%	10.0%	40.1%	21.3%	38.7%	0.518



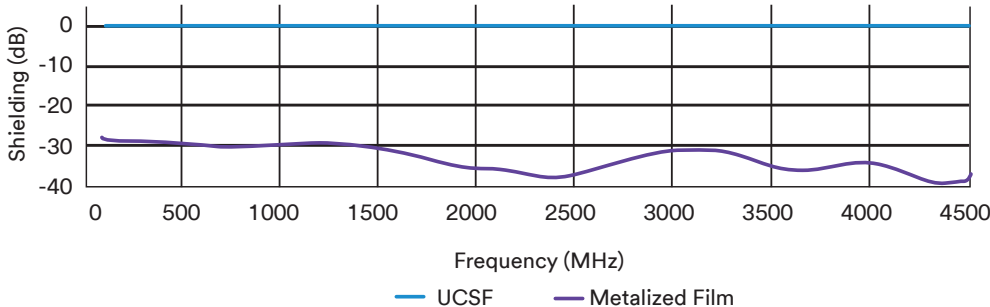
Solar Performance of 3M UCSF at varying angles of incident light



Electronic Signal Shielding Performance (Film only):

UCSF shows no signal attenuation while typical metalized film shows significant attenuation.

EMI Attenuation per ATSM D4935



Testing Description, Results

		Laminate with PVB only	Laminate with PBV + film
Accelerated weathering (ASTM G155; Xenon arc with daylight filters)	Total UV dosage equivalent to 3 yrs. Arizona UV Exposure	$\Delta VLT = -0.40$ $\Delta a^* = 0.00$ $\Delta b^* = 0.18$ $\Delta E^* = 0.37$	$\Delta VLT = -0.70$ $\Delta a^* = 0.02$ $\Delta b^* = 0.34$ $\Delta E^* = 0.82$

¹Marked tests were performed by an outside laboratory. Test report is available upon request.

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 on tests or experience 3M believes reliable, but the accuracy or completeness of such information is not guaranteed.

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