

# Thin Film Electroluminescent Displays - EL



## Embedded Displays for Extreme Conditions

The unique performance and visual characteristics of Thin Film Electroluminescent Displays (EL) make it an ideal solution for the most challenging and demanding applications where other technologies are simply inadequate. Equipment and system designers use electroluminescent displays to fulfill the growing demands from their customers for improved image quality, longer lifetime and higher reliability.

Over the last 27 years our engineers have made continual and dramatic improvements in the brightness of the luminescent films and the development of drive schemes to extend display life. They have significantly improved brightness and contrast, reduced power consumption, developed proprietary gray-scale algorithms, improved packaging to reduce size, enhanced shock and vibration resistance, and extended the temperature range.

### APPLICATIONS:

- Military
- Transportation
- Industrial
- Appliance
- Medical
- Public safety
- Marine



## PLANAR PROVIDES

1. Durable - survives up to 200G shock and 250,000 hour MTBF for display glass
2. Instant pixel response over entire temperature range eliminates motion blur
3. Instant on from -60 °C up to +85 °C

Extreme temperatures and vibrations destroy standard displays.

## BENEFITS

- Wider operating temperature than any other technology, no solar loading
- Long lasting brightness. Doesn't fade like CCFL
- High contrast promotes readability at-a-glance
- Super wide viewing angle

# Thin Film Electroluminescent Displays - For Ultra Wide Temperature Ranges



## Planar's Thin Film EL Displays (TFEL)

Planar's thin film EL displays (TFEL) have the widest operating temperature range of any commercially available technology. TFEL glass can operate to +100 °C. EL modules are rated as low as -60 °C without any decrease in response time.

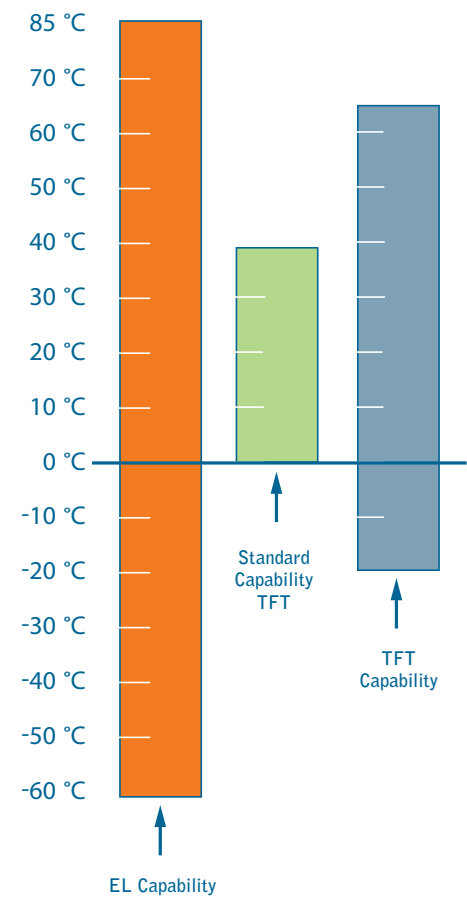
Compare TFEL to TFT displays. Wide temperature TFT displays cannot operate in less extreme temperature ranges at full response time. Even automotive temperature range TFTs will not meet the operating temperature range of TFEL.

[www.planarembded.com/community](http://www.planarembded.com/community)



Watch the video to see for yourself!

### Only EL Offers an Ultra Wide Temperature Range



Example: 10.4" VGA

	TFEL	OLED	TFT	VFD
Temperature Range	1	1	3	1
Shock and Vibration	1	1	3	2
Differential Aging	2	4	1	3

#### ENVIRONMENT

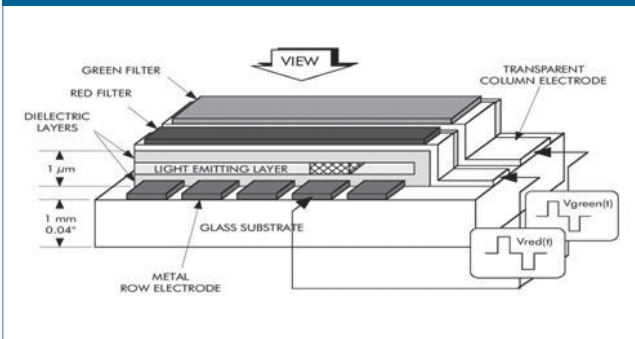
1 = Excellent      2 = Very Good      3 = Good      4 = Poor

# THIN FILM ELECTROLUMINESCENT DISPLAYS

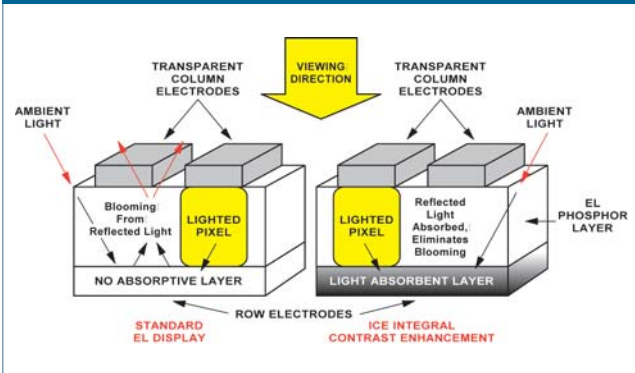
## Most Reliable Display Choice for Extreme Environmental Conditions

# 20 REASONS

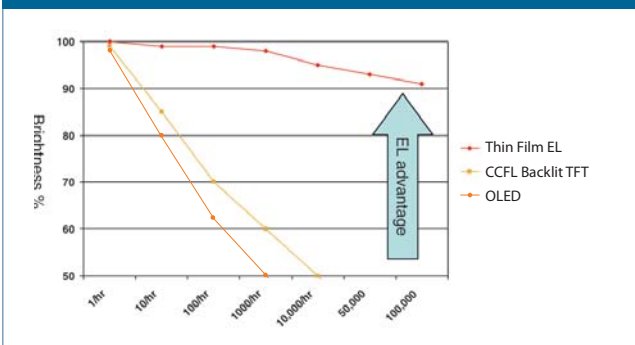
Structure of Thin Film Electroluminescent Display



ICEbrite - Integrated Contrast Enhancement



**Aging Comparison:**  
Planar EL Displays vs. CCFL backlit TFT

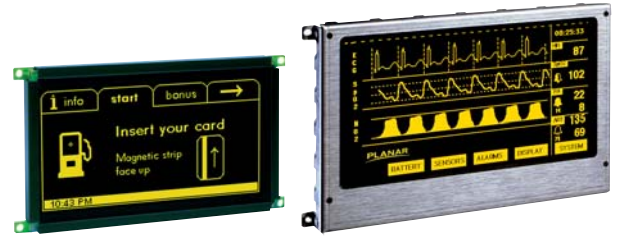


1. "Instant on" module performance as low as -60 °C, with no motion blur, means Planar's displays will function with full operating capability across entire temperature spectrum. TFT LCDs are severely impacted by extreme cold and heat.
2. No heaters required with TFEL means increased product reliability and eliminates image smear artifacts common with TFT AMLCDs used at low temperatures. Glass is functional to -100 °C.
3. <1 ms response time for excellent waveform presentation across entire temperature range.
4. Unaffected by solar loading because glass performs to +100 °C.
5. Up to 85 °C module survival temp, no fan required for cooling, thus increasing reliability.
6. EL glass has 250,000/hr MTBF to reduce your product's warranty costs.
7. 100,000/hr measured brightness with <15% reduction. Compare to TFT AMLCD technology that loses 15% brightness in a single year. TFT AMLCD with CCFL decays to 50% brightness in 50,000 hours or less.
8. High ambient temperature operation does not shorten Planar's module life, unlike LED or CCFL backlighting. High temperature does not decrease light output, unlike LED or CCFL backlighting.
9. Hermetically sealed glass and optional conformal coated circuit board outlasts all other flat panel technologies in moist or humid environments.
10. Integrated Contrast Enhancement (ICE™) delivers up to 1000:1 contrast ratio for daylight readability. Eliminates cost, time and hassle of bonding a TFT AMLCD for improved contrast.
11. Crisp, single color presentation decreases viewing time requirements to facilitate faster user perception. Ideal for industrial, medical, military, and vehicle use.
12. 179° vertical and horizontal viewing angles enable multi-person, off axis viewing.
13. Battery power requirements comparable to backlit TFT LCD.
14. Wide dimming range, doesn't require an expensive, custom backlight inverter like TFT AMLCD.
15. Emissive pixel technology makes small text more legible than LCDs to increase perceptibility.
16. 200G shock durability increases the dependability of your product.
17. All solid-state, digital design eliminates backlight failures.
18. Over 20 years of product life and still going strong! Long product life helps you omit redesigns triggered by component obsolescence.
19. RoHS for worldwide compliance. Mercury free product is better for the environment. Low EMI/EMC to ease certification of your product.
20. Worldwide technical support team.

# EL – THIN FILM ELECTROLUMINESCENT DISPLAYS

## DID YOU KNOW?

- Wide temp versions available up to -60 to +85 °C



MODEL – All resolutions for EL displays are indicated by the model number.	Part Number <sup>1</sup>	Diagonal Size Display Active Area	Pixel Pitch	Brightness Typical @ Max. Frame Rate	Power Typical @ Max. Frame Rate	Operating Temperature	Video Interface	Other Features <sup>2</sup>
EL160.80.50 IN IN LC CC ET ET CC	996-0267-15LF	3.5" (8.93 cm)	0.5 mm	107 cd/m <sup>2</sup> (240 Hz)	4.4 W (240 Hz)	0 ~ +55 °C -25 ~ +55 °C -25 ~ +65 °C -40 ~ +65 °C -40 ~ +65 °C	4 bit LCD	Standard product; IN with locking connectors and conformal coating; Industrial temperature range, dimming; Extended temperature range ET with conformal coating (ET CC only)
	996-0267-20LF	3.2" x 1.6"						
	996-0267-21LF	(79.9 mm x 39.9 mm)						
	996-0267-18LF							
EL160.120.39 CC	996-0303-00LF	3.1" (7.79 cm)	0.39 mm	70 cd/m <sup>2</sup> (150 Hz)	3.0 W (150 Hz)	-50 ~ +70 °C	4 bit LCD	Dimming, locking connector Conformal coating
	996-0303-01LF	2.5" x 1.8" (62.3 mm x 46.7 mm)						
EL240.128.45 CC INT	996-0301-01LF	4.8" (12.2 cm)	0.45 mm	130 cd/m <sup>2</sup> (240 Hz)	5.8 W (240 Hz)	-40 ~ +70 °C	8 bit $\mu$ P	Built-in RAIO RA8835A controller, dimming, locking connector Conformal coating
	996-0301-03LF	4.3" x 2.3" (108.0 mm x 57.4 mm)						
	996-0301-02LF							
EL320.240 FA3 FA3 CC	997-3377-00LF	4.9" (12.4 cm)	0.012" (0.31 mm)	85 cd/m <sup>2</sup> (325 Hz)	4.7 W (325 Hz)	-50 ~ +85 °C	4 bit TFT	Red/Green/Yellow multi-color, 16 colors, dimming, locking connector FA3 with conformal coating
	997-3377-01LF	4.5" x 3.4" (115.1 mm x 86.3 mm)						
EL320.240 HB PT	997-5958-00LF	5.7" (14.4 cm) 4.5" x 3.4" (115.1 mm x 86.3 mm)	0.36 mm	100 cd/m <sup>2</sup> (247 Hz)	5.5 W (247 Hz)	-40 ~ +85 °C	4 bit LCD	5-wire resistive touchscreen and privacy film
EL320.240.36 AG AGL IN IN AG ET ET CC	996-0273-01LF	5.7" (14.4 cm)	0.36 mm	50 cd/m <sup>2</sup> (120 Hz)	7.1 W (120 Hz)	0 ~ +55 °C 0 ~ +55 °C 0 ~ +55 °C -25 ~ +65 °C -25 ~ +65 °C -40 ~ +65 °C -40 ~ +65 °C	4 bit LCD	Standard product AG with locking connector Industrial temperature version, dimming IN with anti-glare film Locking connector, dimming Extended temperature version ET with conformal coating
	996-0273-60LF	4.5" x 3.4" (115.1 mm x 86.3 mm)						
	996-0273-62LF							
	996-0273-02LF							
	996-0273-61LF							
	996-0273-03LF							
EL320.240.36 HB HB NE HB NE CC HB CCB HB SE	996-0292-00LF	5.7" (14.4 cm) 4.5" x 3.4" (115.1 mm x 86.3 mm)	0.36 mm	150 cd/m <sup>2</sup> (247 Hz)	5.5 W (247 Hz)	-40 ~ +85 °C	4 bit LCD	High bright, dimming, locking connector, broad input voltage No mounting ears No mounting ears, conformal coating Conformal coating HB with only top mounting ears
	996-0292-03LF							
	996-0292-02LF							
	996-0292-06LF							
	996-0292-07LF							
EL320.256 F6 FD6 FD7 FD7 HB FD8 V2	996-5076-00LF	4.8" (12.2 cm)	0.3 mm	77 cd/m <sup>2</sup> (60 Hz) 25 cd/m <sup>2</sup> (60 Hz) 55 cd/m <sup>2</sup> (120 Hz) 81 cd/m <sup>2</sup> (150 Hz) 105 cd/m <sup>2</sup> (200 Hz)	4.0 W (60 Hz) 6.0 W (120 Hz) 7.5 W (150 Hz) 9.0 W (200 Hz)	-25 ~ +65 °C	1 or 2 bit LCD	Non-ICE, dimming, broad input voltage F6 with ICE FD7 with higher brightness Requires special mounting configuration
	996-5087-00LF	3.8" x 3.0" (95.9 mm x 76.7 mm)						
	996-5089-00LF							
	996-5089-03LF							
	996-5091-00LF							
EL480.240 PR3	996-0247-05	6.5" (16.5 cm) 5.8" x 2.9" (146.3 mm x 73.1 mm)	0.305 mm	50 cd/m <sup>2</sup> (120 Hz)	6.5 W (120 Hz)	-25 ~ +65 °C	4 bit LCD	ICEBrite
EL512.256 H2 H2 FRA H2 FRB H3 H3 FRA H3 FRB H3 ET FRB	997-3214-00LF	8.6" (21.8 cm)	0.38 mm	65 cd/m <sup>2</sup> (70 Hz)	6.0 W (70 Hz)	0 ~ +55 °C 0 ~ +55 °C 0 ~ +55 °C -25 ~ +65 °C -25 ~ +65 °C -25 ~ +65 °C -40 ~ +85 °C	1 or 2 bit LCD	Dimming, broad input voltage H2 with aluminum frame H2 with steel frame Dimming, Broad input voltage H3 with aluminum frame H3 with steel frame H3 FRB with extended temperature
	997-3215-00LF	7.7" x 3.8" (195.1 mm x 97.5 mm)						
	997-3216-00LF							
	996-5052-00LF							
	996-5059-00LF							
	996-5060-00LF							
	997-2436-00LF							

### Notes:

1. The "LF" suffix on part numbers indicates that the product is in compliance with the EU RoHS requirements. Those products without this suffix are not compliant.
2. For special applications where lead-free solder presents reliability concerns, some products may be available with leaded solder. Please consult your Planar sales contact.

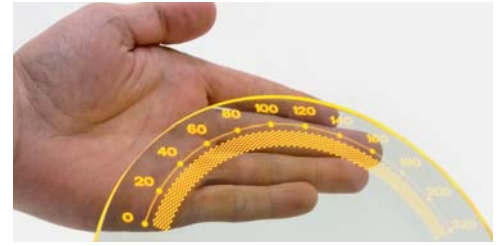
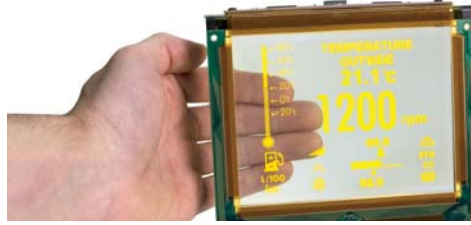


MODEL – All resolutions for EL displays are indicated by the model number.	Part Number <sup>1</sup>	Diagonal Size Display Active Area	Pixel Pitch	Brightness Typical @ Max. Frame Rate	Power Typical @ Max. Frame Rate	Operating Temperature	Video Interface	Other Features <sup>2</sup>	
EL640.200	SK ALE	996-0290-05LF	8.9" (22.6 cm) 8.3" x 3.1" (211.2 mm x 79.2 mm)	0.33 mm x 0.396 mm	81 cd/m <sup>2</sup> (240 Hz)	7.6 W (240 Hz)	-40 ~ +85 °C	4 bit (Buffered) 8 bit (Non-buffered)	ICEBrite, two modes (buffered and non-buffered) dimming, and locking connector SK with conformal coating
	SK CC	996-0290-06LF							
EL640.400	C2	997-3217-00LF	9.1" (23 cm) 7.7" x 4.8" (195.0 mm x 121.8 mm)	0.3 mm	53 cd/m <sup>2</sup> (70 Hz)	11.0 W (70 Hz)	0 ~ +55 °C	1 or 2 bit LCD	C2 with aluminum frame Non-ICE, dimming, wide input voltage, industrial temperature range C3 with aluminum frame ICE, dimming, wide input voltage, industrial temperature range CD3 with aluminum range
	C2 FRA C3	997-3218-00LF 996-5056-00LF					-25 ~ +65 °C		
	C3 FRA CD3	996-5062-00LF 996-5082-00LF			21 cd/m <sup>2</sup> (70 Hz)		-25 ~ +65 °C -40 ~ +65 °C		
	CD3 FRA	996-5082-01LF					-25 ~ +65 °C		
EL640.400	CB1	996-5072-00LF	9.1" (23 cm) 7.7" x 4.8" (195.0 mm x 121.8 mm)	0.3 mm	53 cd/m <sup>2</sup> (70 Hz)	11.0 W (70 Hz)	0 ~ +55 °C	1 or 2 bit LCD	Non-ICE, dimming, +5 and +12 V input voltage, aluminum frame CB1 with aluminum frame CB series display with a VH of 24 V ICE display, dimming, +5 and +12 V input voltage, aluminum frame
	CB1 FRA CB3 FRA	996-5073-00LF 996-5078-00LF							
	CD4 FRA	996-5085-00LF E0064450301LF			22 cd/m <sup>2</sup> (70 Hz)				
EL640.480	AF1 AF1 AG AF1 ET	996-0270-00LF 996-0270-01LF 996-0270-05LF	6.4" (16.2 cm) 5.1" x 3.8" (129.3 mm x 97.0 mm)	0.2 mm	65 cd/m <sup>2</sup> (120 Hz)	4.5 W (120 Hz)	-5 ~ +55 °C -5 ~ +55 °C -40 ~ +85 °C	8 bit LCD	ICEBrite, dual panel interface AF1 with anti-glare film AF1 with extended temperature, locking connector, dimming
	AG1 AG1 AG AG1 ET	996-0269-00LF 996-0269-01LF 996-0269-03	8.1" (20.5 cm) 6.5" x 4.8" (165.1 mm x 123.8 mm)	0.26 mm	55 cd/m <sup>2</sup> (120 Hz)	6.5 W (120 Hz)	-5 ~ +55 °C -5 ~ +55 °C -40 ~ +85 °C	8 bit LCD	ICEBrite, dual panel interface AG1 with anti-glare film Extended temperature, wide input voltage AG1 ET with conformal coating
	AG1 ET CC	996-0269-05					-40 ~ +85 °C		
EL640.480	AM1 AM1 AG AM8 IN	996-0268-00LF 996-0268-02LF 996-0268-27LF	10.4" (26.4 cm) 8.3" x 6.2" (211.1 mm x 158.3 mm)	0.33 mm	55 cd/m <sup>2</sup> (120 Hz)	11.0 W (120 Hz)	-5 ~ +55 °C -5 ~ +55 °C -40 ~ +65 °C	8 bit LCD	ICEBrite, dual panel interface AM1 with anti-glare film Industrial operating temperature range, dimming, 24 V option, low profile, dual panel interface Extended operating temperature AM8 ET with conformal coating Anti-glare Extreme low operating temperature AM8 ETL with conformal coating Anti-glare
	AM8 ET	996-0268-16LF					-40 ~ +65 °C		
	AM8 ET CC	996-0268-20LF					-25 ~ +65 °C		
	AM8 ET CC AG	996-0268-31LF					-60 ~ +65 °C		
	AM8 ETL	996-0268-28LF					-60 ~ +65 °C		
	AM8 ETL CC	996-0286-29LF					-60 ~ +65 °C		
	AM8 ETL CC AG	996-0268-30LF							

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# Transparent EL - See-Through TFEL Displays



## Transparent EL for Design Innovations

Break display design boundaries! See-through display technology is ideal for applications that require an upscale, fresh new look with wide angle and crisp viewing characteristics. The easily customizable glass panel can be drilled, curved, or cut in other unusual shapes to help bring innovative, easily manufacturable products to life. A perfect solution for designs in transportation, premier pro-consumer electronics and architectural applications.

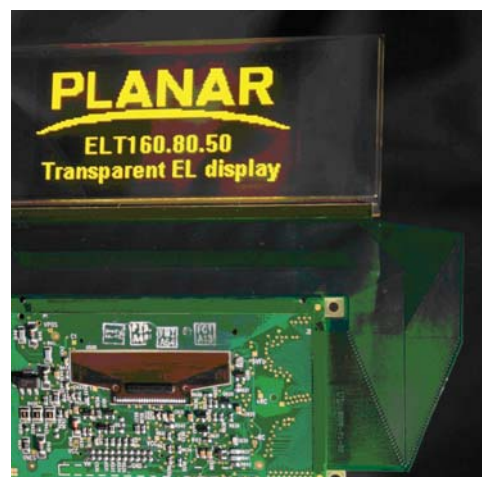
- Viewing performance of standard Planar electroluminescent (TFEL) displays, but with transparency.
- Affordable custom display text or graphic layouts possible.
- Upgrades product appearance from LED or TN LCD display technologies.
- Holes can be drilled directly into the panel. Curved glass is possible.
- RoHS compliant.

## PLANAR PROVIDES

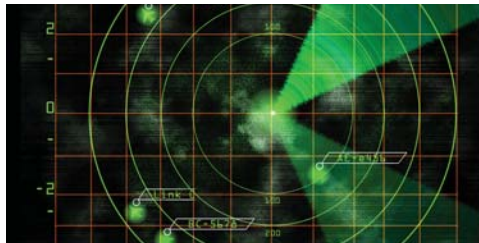
1. Transparency combined with ruggedness
2. Can be cut into curved shapes
3. Holes can be drilled directly into the panel

**A see-through display provides a visual advantage for many products.**

SPECIFICATIONS	ELT160.80.50
Display Type	Transparent Thin Film Electroluminescent (TFEL)
Active Area	80 mm x 40 mm
Glass Size	129 mm x 55 mm
Pitch	0.55 mm
Brightness (typical)	75 cd/m <sup>2</sup> (240 Hz) 19 cd/m <sup>2</sup> (60 Hz)
Viewing Angle (typical)	>179° (viewing possible from 2 sides)
Response Time (typical)	<1 ms
Video Inputs	4 bit LCD
Operating Temperature	-40 °C to +65 °C
Power Consumption (typical)	4.4 W (240 Hz) 2 W (60 Hz)
Service and Support/Warranty	1 Year



# TFEL Glass - Affordable EL Glass Without Electronics



## Maximum Performance. Proven Technology.

Want to design your own electronics but still want the inherent ruggedness of Planar thin film electroluminescent displays? Planar EL glass provides you with the lowest material cost method of embedding an EL display in your OEM product. If you don't have the design expertise to build custom electronics, our experienced engineering team can help with that, too. We want to help your project succeed.

## PLANAR PROVIDES

1. Possibility to design and use your own electronics with Planar EL glass
2. Get the benefits of thin film electroluminescent displays at an affordable price point

## BENEFITS

- **RUGGED** - Planar EL displays are built for demanding conditions: cold, heat, wind, dust, vibration, sunlight - even g-forces. Operating temperature of the glass is -100 °C ~ +105 °C.
- **RELIABLE** - Our electroluminescent displays are field-proven to retain more than 90 percent of their original luminance after more than 100,000 hours of operation. Planar has produced well over one million EL displays for rugged military, medical and industrial products.
- **VISIBLY DIFFERENT** - Our proprietary ICEBrite (Integral Contrast and Brightness Enhancement) technology offers unparalleled image quality in a wide range of challenging visual conditions. Our EL glass can be used to make transparent displays.
- **FLEXIBLE** - As a display material, you can develop the electronics to fit your exact needs. We even offer engineering design services to support your team in developing the electronics and interface solutions for your OEM product.
- **AFFORDABLE** - EL glass provides the lowest material cost without giving up the viewing performance and environmental characteristics of our EL modules.

[www.planarembded.com/el-glass-design-guide](http://www.planarembded.com/el-glass-design-guide)



**WANT MORE INFORMATION?**  
Download the EL Glass Design Guide Summary

EL GLASS ASSEMBLY		Width	Active Area Width	Height	Active Area Height	Electrode	Thickness
ELGA 640.480	AM1	241 mm	225 mm	184 mm	168 mm	Black	2.2 mm
	AG1	192 mm	176 mm	150 mm	134 mm	Black	2.2 mm
	AF1	156 mm	140 mm	122 mm	107 mm	Black	2.2 mm
ELGA 480.240	PR1	170 mm	160 mm	91 mm	87 mm	Black	2.2 mm
ELGA 320.240.36		131 mm	125 mm	102 mm	96 mm	Black	2.2 mm
ELGA 240.128		126 mm	122 mm	75 mm	72 mm	Black	2.2 mm
ELGA 160.80.50		97 mm	91 mm	54 mm	51 mm	Black	2.2 mm
ELGA 160.120.39		78 mm	72 mm	60 mm	57 mm	Black	2.2 mm
ELGA 120.18		159 mm	121 mm	33 mm	20 mm	Transparent	2.2 mm

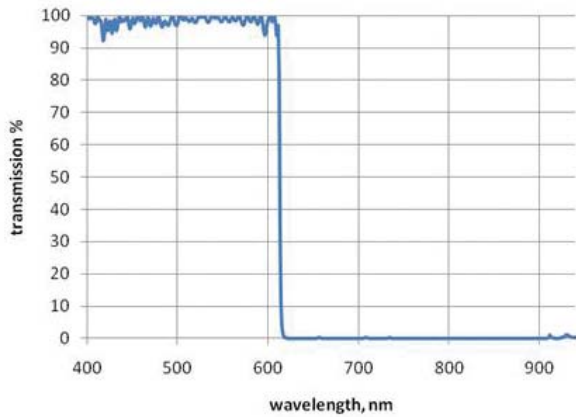
# High Performance ALD Optical Filters - Suitable for EL and AMLCD



ITAR applies for NVIS filters

For over 27 years, Planar has used Atomic Layer Deposition (ALD) in production of electroluminescent (EL) displays. With this technology, it has been possible to create displays, which withstand harsh environmental conditions, are very reliable and rugged enough for the toughest display users' requirements.

Now, we are expanding this expertise in thin films to ALD interference filters, which are perfect for IR blocking in NVIS applications and can also be used for any spectral filtering in the VIS/NIR region.



## What are the benefits to the users?

- No light leaking pinholes: filtering is complete
- High reliability: stable in extreme humidity and temperature
- Better uniformity than PVD films: optical performance more consistent on larger surfaces

	Absorption Filters	PVD - Interference Filters	ALD - Interference Filters
Cut-off Characteristics	Gradual	Sharp	Sharp
Uniformity	Good	Moderate/Good	Very Good
Environmental Stability	Good	Moderate/Good	Excellent
Non-flat Substrates	Yes (molded)	No	Yes
Cost	High	High	Very Competitive

## PLANAR PROVIDES

Unique characteristics of ALD films:

- Virtually pinhole free
- High density resulting in high environmental stability
- Precise deposition control to an area up to 350 mm x 210 mm
- Even filters on uneven surfaces are possible

## BENEFITS

- High transmission >90% in visible range
- Minimal color shift variation
- Steep and stable cut-off
- Up to OD 6 attenuation in NIR region
- Uniformity – no visible variations across the area
- Competitive cost