EL552.256-Q2

ICEBRITE™ EL DISPLAY

PLANAR®
The Definition of Quality

Revision Control

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EL552.256-Q2 Display

The EL552.256-Q2 thin film electroluminescent (EL) display is a high-performance alternative to lower resolution LCDs and VFDs and is the ideal solution in demanding applications where superior visual performance and environmental ruggedness are critical. The display consists of an EL glass panel and control electronics assembled into a space-saving, rugged package for easy mounting and a separate DC/DC converter with interconnecting cable.

The EL552.256-Q2 display utilizes Planar's proprietary Integral Contrast Enhancement (ICE™) technology to achieve unparalleled image quality without the use of expensive filters. This small graphics display excels in a wide range of ambient lighting environments while effectively eliminating the blooming common to other high-bright displays.

The 4-bit LCD-type interface is TTL-compatible and is designed for hardware compatibility with the SMOS 1353 or equivalent LCD controller. Each of the 141,312 pixels has an aspect ratio of 1:1 and is individually addressable to clearly display high information content graphics and text.

Features

- Excellent visual performance:
  - High brightness and contrast
  - Wide viewing angle > 160°
- Rapid display response < 1 ms
- Low EMI emissions
- Extremely rugged and durable
- Reliable, long operating life with > 30,000 MTBF
- Separate DC/DC converter
- 4-bit LCD-type interface

Installing and Handling

Do not drop, bend or flex the display. Do not allow objects to strike the surface of the display.

CAUTION: The display uses CMOS and power MOSFET devices. These components are electrostatic-sensitive. Unpack, assemble, and examine this assembly in a static-controlled area only. When shipping, use packing materials designed for protection of electrostatic-sensitive components.

Mounting EL Displays

Properly mounted, EL displays can withstand high shock loads as well as severe vibration found in demanding applications. However the glass panel used in an EL display will break if subjected to bending stresses, high impact, or excessive loads.

CAUTION: To prevent injury in the event of glass breakage, the use of an impact resistant shield or a protective overlay should be used on the viewer side of the display.

Stresses are often introduced when a display is mounted into a product. Ideally, the mounting tabs of the display should be the only point of contact with the system. Use a spacer or boss for support; failure to do so will bend the display and cause the glass to break. The instrument enclosure or frame should not flex or distort in such a way that during use the bending loads might be transferred to the display. Mounting surfaces should be flat to within ±0.6 mm (±0.025"). Use all the mounting holes provided. Failure to do so will impair the shock and vibration resistance of the final installation.

The EL552.256-Q2 is a tab-mounted display. Use standoffs of appropriate length to assure that screws through the mounting tabs do not introduce bending stresses to the display. Do not deflect the ECB out of its normal plane. The EL552.256-Q2 mounting tabs were designed for a 3 mm screw. The EL552.256-Q2 NE display does not have mounting tabs. Contact Planar Applications Engineering for information on mounting the EL552.256-Q2 NE display.

WARNING: These products generate voltages capable of causing personal injury (high voltage pulses up to 230 V_{AC}). Do not touch the display electronics during operation.

Cable Length

A maximum cable length of 0.6 m (24 in.) is recommended. Longer cables may cause data transfer problems between the data transmitted and the display input connector. Excessive cable lengths can pick up unwanted EMI. There are third party products which allow this maximum cable length to be exceeded. Contact Planar Application Engineering for more information.

Cleaning

As with any glass or coated surface, care should be taken to minimize scratching. Clean the display glass with mild, water-based detergents only. Apply the cleaner sparingly to a soft cloth, then wipe the display. Disposable cleaning cloths are recommended to minimize the risk of inadvertently scratching the display with particles embedded in a re-used cloth.

Avoiding Burn-In

As with other light emitting displays, displaying fixed patterns on the screen can cause burn-in, where luminance variations can be noticed. Use a screen saver or image inversion to avoid causing burn-in on the display.

Specifications

The EL panel is a matrix structure with column and row electrodes arranged in an X-Y formation. Light is emitted when an AC voltage of sufficient amplitude is applied at a row-column intersection. The display operation is based on the symmetric, line-at-a-time data addressing scheme.

Performance characteristics are guaranteed when measured at 25 °C with rated input voltage unless otherwise specified. Planar does not recommend operation of the display outside these specifications.

Power-up Sequence

This display requires simultaneous 12V and 5V input in addition to video signals for proper operation. It is important that your design provides these signals simultaneously. If these signals are not simultaneous, they must meet the sequential timing shown in Figure 1 below.

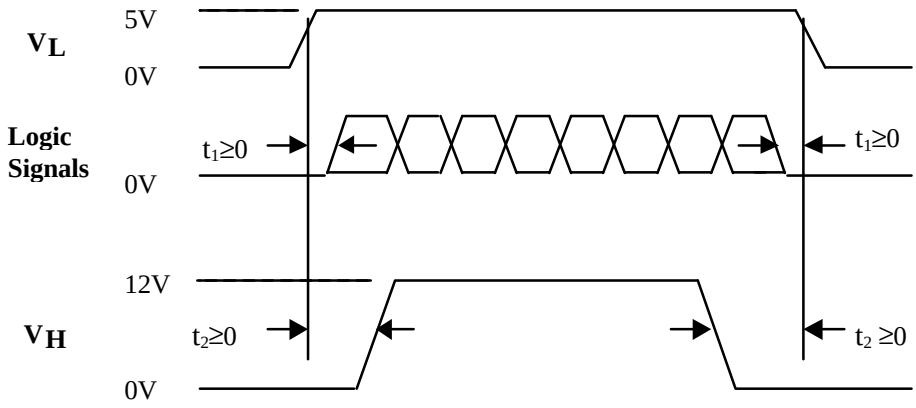


Figure 1. Power Supply and Logic Signal Sequencing

Note: To ensure the long-term reliability of the display, the proper power-up sequence must be used and the minimum and maximum specifications in this manual should be met without exception.

All internal high voltages are generated from the display supply voltage (V_H). The logic supply voltage (V_L) should be present whenever video input signals or

V_H is applied. The minimum and maximum specifications in Table 1 should be met, without exception, to ensure the long-term reliability of the display. The video inputs, shown in Table 2, pass from the video source to the display through the DC/DC converter.

Table 1. Video Input Voltage Requirements

Description	Min.	Max.	Units
Maximum input voltage	--	5.5	V
Low-level input voltage (VIL)	-0.3	0.9	V
High-level input voltage (VIH)	3.7	5.0	V
Low-level input current (IIL)	--	-0.4	mA
High-level input current (IIH)	--	10	µA
Output high voltage (@ Ioh=0.4mA)	2.4	--	V
Output low voltage (@ Iol=2.1mA)	--	0.4	V
All inputs are CMOS with 130 W series resistors, except VS, which is 1K W.			

Connector

The EL552.256-Q2 display package includes a DC/DC converter and a cable for connecting it to the display. As shown in Figure 2, the display is connected to the converter (Connector J1 to J3) with the supplied cable, then the converter has a connector (Connector J0) for interfacing with the customer design.

Connectors	
JO	T&B Ansley 609-1630
J3	T&B Ansley 609-2630
J1	T&B Ansley 609-2030

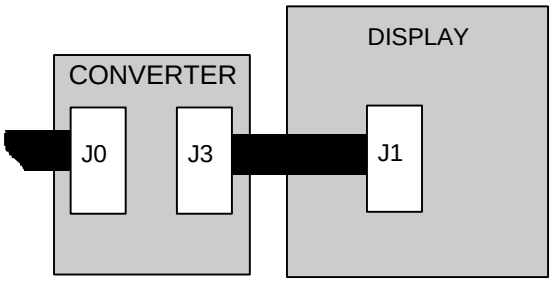


Figure 2. Connectors

Both the J0 and the J3 are low-profile male PCB header connectors with dual-row contacts on 0.00" centers. Video signals and +12 V DC power are connected to Connector J0 on the DC/DC through a 16-pin T & B Ansley connector, part number 609-1630 or equivalent with the pin assignment shown in Table 2.

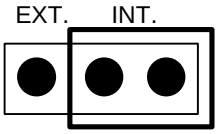
Table 2. Connector P0 Pinouts

Pin	Function	Pin	Function
1	V_H (+12V)	2	V_H (+12V)
3	V_L (+5V)	4	V_L (+5V)
5	VID_2	6	VID_1
7	Ground	8	Ground
9	VS	10	Ground
11	HS	12	Ground
13	VCLK	14	Ground
15	VID_0	16	VID_3

DC/DC Converter (Power Supply)

The display comes with the PS512-6, which is an efficient multiple-output DC-to-DC switching power supply assembly. The power supply provides the unique voltage requirements for EL displays. Its input voltages are +12V only or both +12V and +5V.

A square-pin jumper (J4) is provided to select between these two input configurations and is in the +5V position when the product is shipped.



Default Jumper Setting

The following table shows the input voltage for the PS512-6 power supply for the +12V and the +12V/+5V configurations.

Table 3. Power Supply Input Voltages

+12V and +5V Input				
Description	**Name**	**Min.**	**Max.**	**Units**
Input voltage: nom. = 12.0 V	VH	10.8	13.2	VDC
Input voltage: absolute max.	VH max	---	15.0	VDC
Input current: max.	IH max	---	0.9	A
Input voltage: nom. = 5.0 V	VL	4.75	5.25	VDC
Input voltage: absolute max.	VI max	---	7.5	VDC
Input Current max	IL max	---	0.1	A

+12V Only Input				
Description	**Name**	**Min.**	**Max.**	**Units**
Input voltage: nom. = 12.0 V	VH	10.8	13.2	VDC
Input voltage: absolute max.	VH max	---	15.0	VDC
Input current: max.	IH max	---	1.0	A

Interface Information

This Planar EL display incorporates an interface that is similar to many LCD interfaces. This interface is supported by a variety of off-the shelf chip sets which take care of all display control functionality, freeing the system processor for other tasks. Designers should select the chip set that best suits their particular architecture and price point.

Video Input Signals

The **VS** signal may be independently set to a CMOS low level at any time for longer than one frame period. During the time of **VS** inactivity the display is blank. Halting **VS** results in a standby condition to minimize power usage.

The end of the top line of a frame is marked by **VS**, vertical sync signal as shown in Figure 3. The end of each row of data is marked by **HS**.

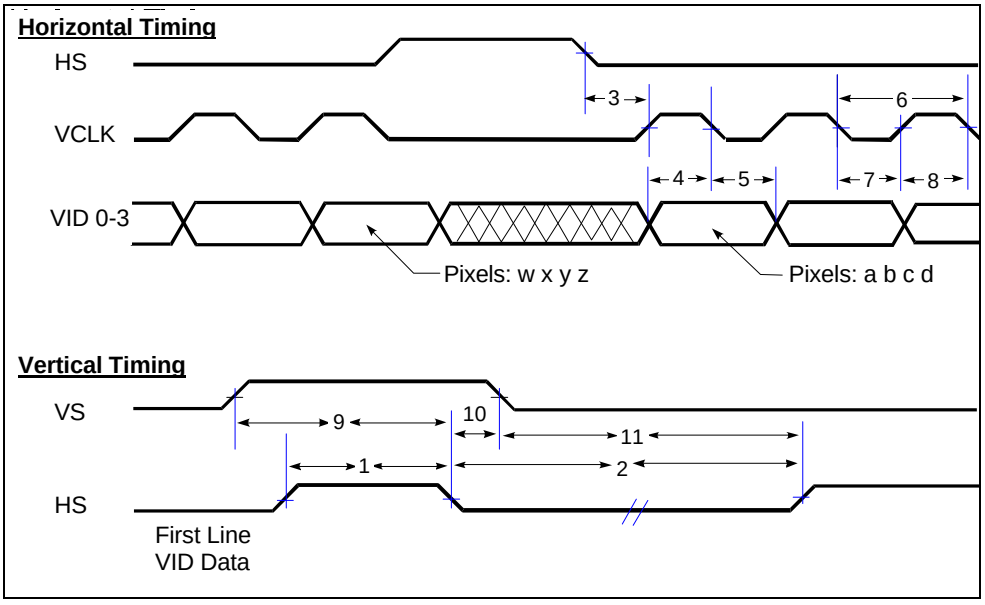


Figure 3. Video Input Timing Diagram

Timing is compatible with LCD graphics controllers such as the SMOS and C&T display controllers.

Table 4. Video Input Descriptions

Num	Description	Symbol	Min.	Typ.	Max.	Units
1	HS high time	tHSh	20			nsec
2	HS hold after VCLK	tHShd	20			nsec
3	HS setup to VCLK	tHSsu	20			nsec
4	VID setup to VCLK	tVIDsu	20			nsec
5	VID hold from VCLK	tVIDhd	20			nsec
6	Video clock period	tVCLK	100			nsec
	VCLK rise, fall time	tVCLKrf			15	nsec
7	VCLK low width	tVCLKl	15			nsec
8	VCLK high width	tVCLKh	15			nsec
9	VS setup to HS	tVSsu	140			nsec
10	VS hold after HS	tVShd	140			nsec
11						nsec
12	HS period	tHS	32.5			usec
	VS period	tVS	256			tHS
	Frame Rate	fVS	50		120	Hz

Input signals **VID_0** through **VID_3** contain the video data for the screen. As shown in Figure 4, pixel information is supplied from left to right and from top to bottom, four pixels at a time. Video data for one row is latched on the fall of **HS**.

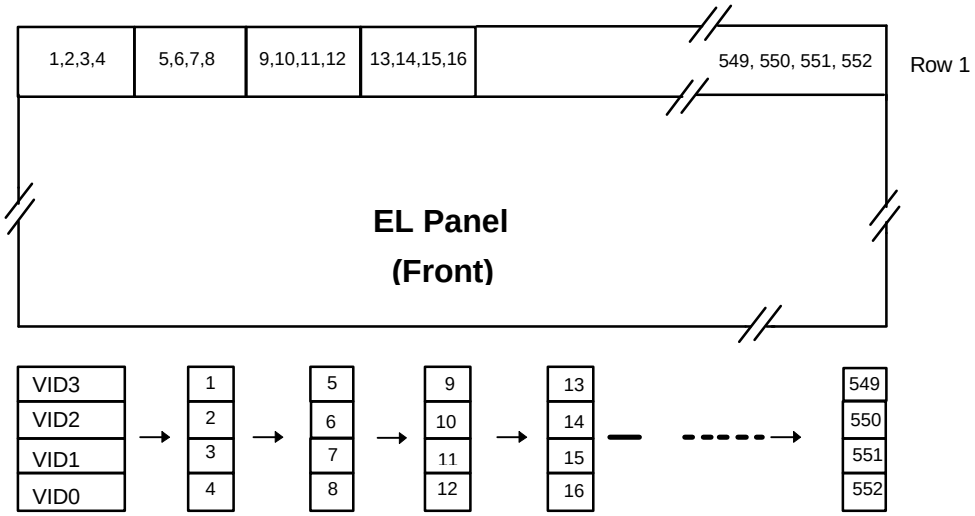


Figure 4. Pixel Location vs. Sequence of Data

Self-Test Mode

The display will enter the self-test mode if all seven video inputs (VCLK, HS, VS, and VID0 through VID3) are high for longer then 2.5 seconds at power up. The self-test scans at 100 Hz with a diagonal pattern that changes back and forth every 2.5 seconds from 3 pixels on/1 pixel off to 1 pixel on/3 pixels off.

After the self-test, turn the display off and wait at least 15 seconds before reapplying power to allow the internal capacitors to completely discharge. When you turn the display on again, apply video signals in less than 2.5 seconds after power up to enter normal operation.

Optical

Table 5. Optical Specifications

Luminance		
L_{on} (areal), min	34.5 cd/m²	screen center, 120 Hz frame rate
L_{on} (areal), typ	50 cd/m²	screen center, 120 Hz frame rate
L_{off} (pixel), max	0.2 cd/m²	5 points: center plus four corners measured 1.0 ± 0.025" from adjacent display edges, 120 Hz
Non-uniformity		
All pixels fully lit	26%	Maximum difference two of five points, using the formula: LNU%=[1- (min_lum/max_lum)] x 100
Luminance Variation (Temperature)		
Maximum	±15%	Across operating temperature range
Luminance Variation (Time)		
Maximum	<10%	15,000 hours at 25 °C ambient
Viewing Angle		
Minimum	>160°	
Contrast Ratio		
Minimum	20:1	@ 500 lux ambient, 120 Hz frame rate
Typical	40:1	

Generating Grayscales

Some applications may benefit by using grayscales. The Q2 has a maximum frame rate frequency of 120 Hz. Using the higher frame rate, combined with flat panel controllers designed for this faster display, it is possible to generate usable grays through frame rate control and dithering. Video controllers from manufacturers such as C&T, SMOS, and Cirrus Logic use these methods with proprietary algorithms to generate grayscales.

The response time of electroluminescent displays is much faster than LCDs, therefore not all possible grayscales generated by the video controller are actually usable. Many of the grayscales may flicker or swim. Careful testing is necessary to select appropriate grayscales for an application, especially when the electroluminescent displays are driven at less than their maximum frame rate.

For additional information, refer to Planar Application Note 119, *Generating Grayscales*, or contact Planar's Application Engineering.

Environmental

Table 6. Environmental Specifications

	Operating	Non-operating
Temperature*	0 to +65 °C	-40 °C to +75 °C
Humidity		
Non-condensing	to 93% RH max @40 ºC, per IEC 68-2-3	
Altitude		
Tested per IEC 68-2-13	16,000 ft. (4.8 km)	58,000 ft. (17.7 km)
Vibration (random)		
(Operating/non-operating)	0.02 g^2/Hz at 20-500 Hz for 30 minutes on each axis, per IEC 68-2-36, test Fdb.	
Mechanical Shock		
Operating/non-operating	50 g with 11 ms duration, half sine wave, 3 shocks on each of 6 surfaces, per IEC 68-2-27, test Ea.	

** The EL display will function at operating survival temperatures (-20 to +70 °C) for a 24-hour period and incur no damage, but may not meet some specifications above the +65°C operating limit.*

Reliability

The display mean time between failure (MTBF) is demonstrated to be greater than 30,000 hours at 25 °C ambient with a 90% confidence level.

Safety and EMI Performance

The display will not inhibit the end product from obtaining UL1950, CSA950, or IEC 601-1 safety certification.

When housed in a suitable enclosure, the display is capable of being operated in a final product that complies with CISPR 11 level B, IEC 801-2 (ESD), and IEC 801-3 (EMI susceptibility).

Mechanical Specifications

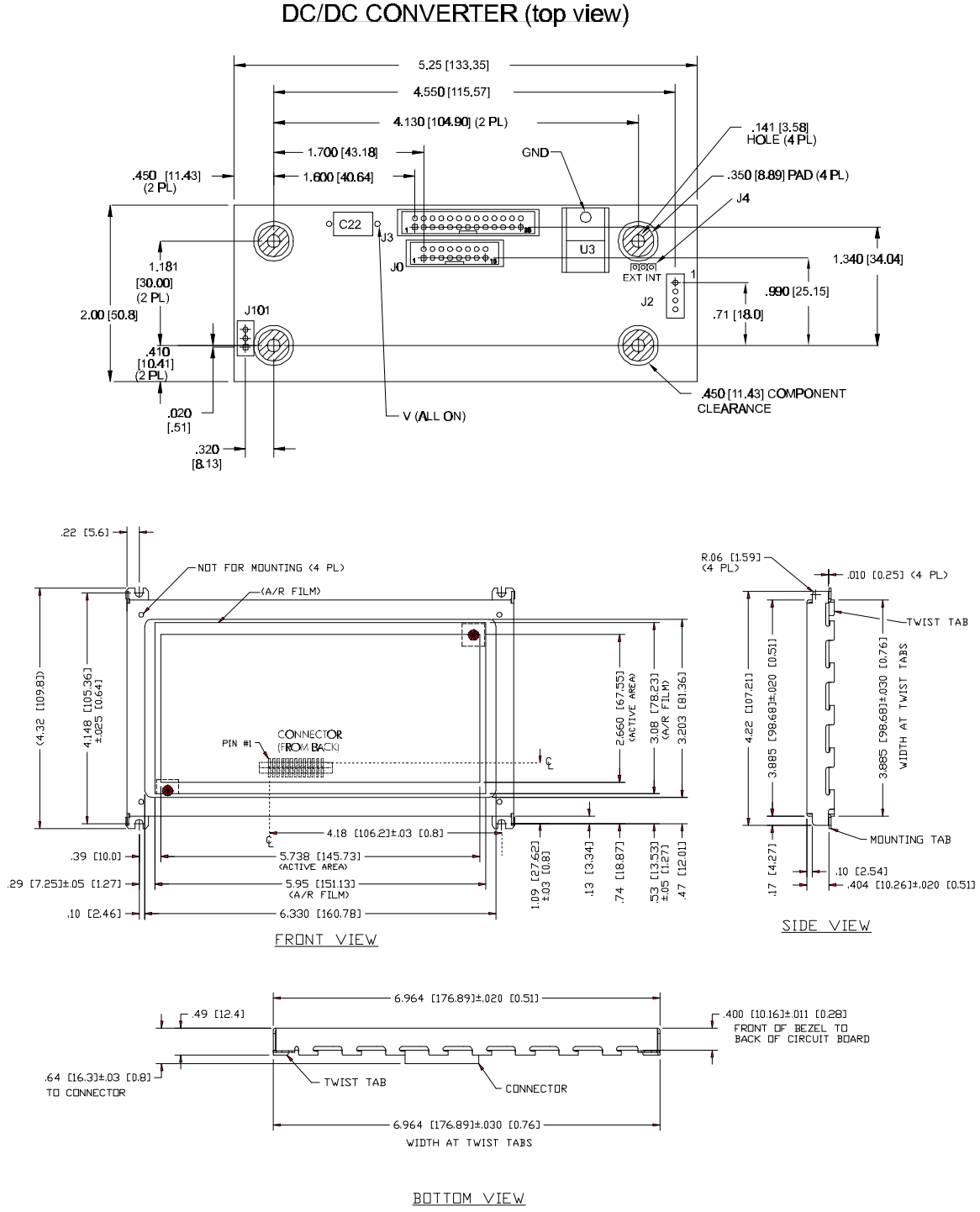
Table 7. Mechanical Specifications

Display External Dimensions millimeters (inches)	Height	109.73 (4.32)
	w/o mounting tabs	98.68 (3.885)
	Width	176.78 (6.96)
	Depth*	16.26 (0.64)
DC/DC Converter Dimensions	Height	19.05 (0.750)
	Width	50.8 (2.0)
	Length	133.35 (5.250)
Display Weight	262 grams (0.6 lbs.), nominal	
DC/DC Converter Weight	9.33 grams (0.187 lbs.)	
Fill Factor	59.2% nominal	
Active Area millimeters (inches)	Width	67.564 (2.660)
	Height	145.745 (5.738)
	Diagonal	6.33"
Pixel Size millimeters (inches)	Width	0.203 (0.008)
	Height	0.203 (0.008)
Pixel Pitch millimeters (inches)	Width	0.264 (0.0104)
	Height	0.264 (0.0104)
* Without DC/DC Converter		

Component Envelope

The component envelope shown in Figure 5 illustrates the distance components extend behind the display. Tall components do not necessarily fill this area. Planar reserves the right to relocate components *within* the constraints of the component envelope without prior customer notification. For this reason, Planar advises users to design enclosure components to be outside the component envelope.

An air gap of at least 5 mm is recommended to dissipate heat from display components. Device designers will need to consider their specific system requirements to determine the necessary spacing.



Dimensions of the display are in millimeters; inches are in brackets. Dimensions of the DC/DC Converter are in inches; millimeters in brackets. Some hidden lines are omitted for clarity.

Figure 5. Display Dimensions

Note: The dimensions in this drawing are approximate. Please contact Planar Applications Engineering to request the actual drawing prior to beginning your design.

Description of Warranty

This description is not the full warranty, and should not be construed as a substitute for the full warranty. A copy of the full warranty is available upon request.

Planar warrants that the goods it sells will be free of defects in materials and workmanship, and that these goods will substantially conform to the specifications furnished by Planar, and to any drawings or specifications furnished to the Seller by the Buyer if approved by the Seller. This warranty is effective only if Planar receives notice of such defect or non-conformance during the period of warranty, which begins the day of delivery.

The goods Planar sells are warranted for a period of one year unless otherwise agreed to by Planar and the Buyer. The Buyer must return the defective or non-conforming goods, upon request, to Planar not later than 30 days after Planar's receipt of notice of the alleged defect or non-compliance. Buyer shall prepay transportation charges, and Planar shall pay for return of the goods to the Buyer. No goods are to be returned to Planar without prior permission.

The warranty does not apply in cases of improper or inadequate maintenance by the Buyer, unauthorized modification of the goods, operation of the goods outside their environmental specifications, neglect or abuse of the goods, or modification or integration with other goods not covered by a Planar warranty when such modification or integration increases the likelihood of damage of the goods.

Ordering Information

Product	Part Number	Description
EL552.256-Q2	996-0245-02	EL552.256-Q2 ICEBrite display, operating temperature range 0 to +65 °C.
EL552.256-Q2 NE	996-0245-03	EL552.256-Q2 flat panel display assembly with mounting tabs removed.

Design and specifications are subject to change without notice.

Planar Systems continues to provide optional, and in many cases custom, features to address the specific customer requirements. Consult Planar Sales for pricing, lead time and minimum quantity requirements.

Support and Service

Planar Systems, Inc. is a US company based in Beaverton, Oregon and Espoo, Finland, with a world-wide sales distribution network. Full application engineering support and service are available to make the integration of Planar displays as simple and quick as possible for our customers.

RMA Procedure: For a *Returned Material Authorization* number, please contact Planar Systems, Inc. with the model number(s) and serial number(s). When returning goods for repair, please include a brief description of the problem, and mark the outside of the shipping container with the RMA number.

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Visit the Planar website at **http://www.planar.com** for Application Notes and other Operating Manuals