Landmark Technology

LMG257-185XTN

18.5" Sunlight Readable LCD Module

Introduction

The LMG257-185XTN is a 18.5" Sunlight Readable LCD module. The module consists of an AUO M185XTN01.2 TFT color LCD panel and a VHB (very high brightness) LED backlight in a side mount package of about 10 mm maximum thickness.

At the maximum backlight power of 22.5 Watts, the LMG257-185XTN delivers a very high screen brightness of 1,250 Cd/m^2 (nits). At this level, the display is readable under direct sunlight. For applications in dark environments, the screen brightness can be adjusted down to less than 5 Cd/m^2 using a proper LED drive board with PWM dimming control.

Characteristics (Note 1, 2)

Parameters	Typical Value	Units	Conditions
LCD Screen Luminance	1,250	Cd/m^2	LCD displays the brightest white
Luminance Variation	±20% or better		Note 3
Backlight Power Consumption	22.5	Watts	Excluding LED driving board losses
Typical LCD Contrast Ratio	800:1		White vs. Black (measured in the dark at the normal direction)
Typical Viewing Angles			
3:00 o'clock direction	85	Degrees	Contrast ratio ≥ 10
9:00 o'clock direction	85	Degrees	Contrast ratio ≥ 10
6:00 o'clock direction	80	Degrees	Contrast ratio ≥ 10
12:00 o'clock direction	80	Degrees	Contrast ratio ≥ 10
LCD Screen Chromaticity (x, y)			Measured at the direction perpendicular to the LCD
White	(0.269, 0.314)		
Red	(0.625, 0.341)		
Green	(0.290, 0.651)		
Blue	(0.142, 0.052)		
LCD Module Weight	1,350	Grams	
Display Resolution	1,366 x 768		
Operating Temperature Range	0 to 50	ºC	
Storage Temperature Range	-20 to 60	ºC	

Note 1: Please refer to the AUO M185XTN01.2 data sheet for detailed LCD electrical specifications and general precautions.

Note 2: All data are measured at 25^{o}C ± 2^{o}C ambient temperature.

Note 3: Screen luminance is measured at 9-point positions as shown in the AUO M185XTN01.2 data sheet. The luminance variation is the percent deviation of the maximum and minimum values measured versus the average luminance value of the 9 points. .

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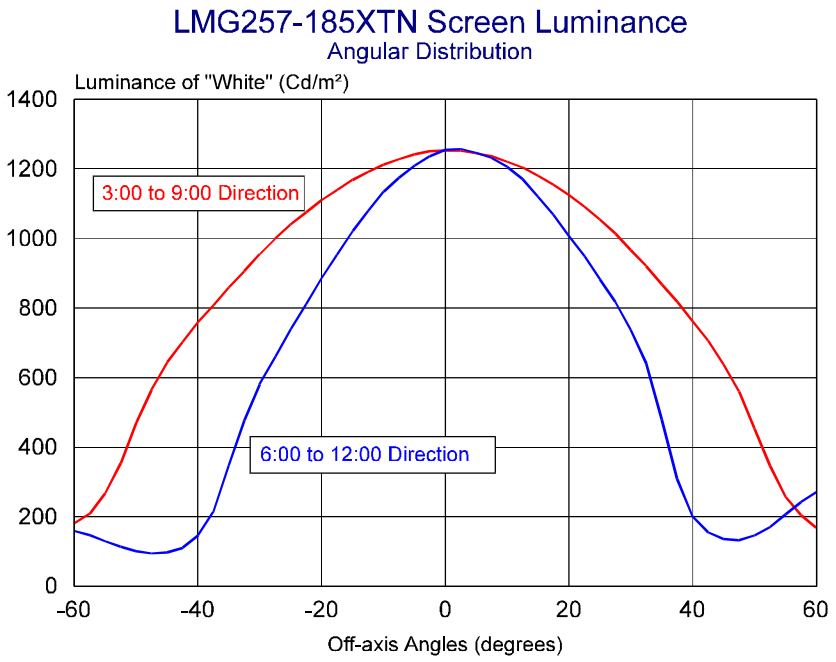
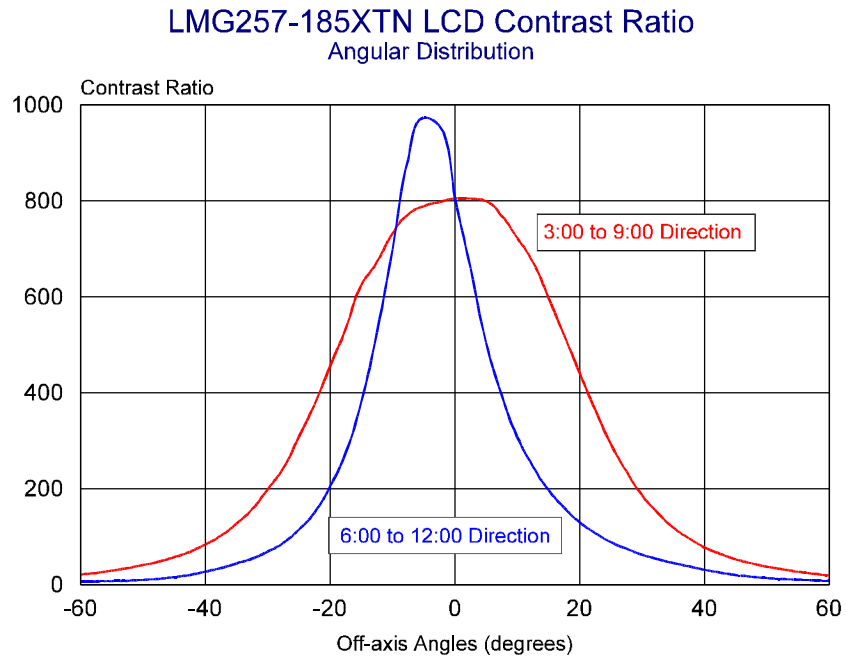
LCD Module Optical Performances

Luminance & Contrast Ratio

The typical LMG257-185XTN LCD module screen luminance and contrast ratio are shown in the figures below: Since the AUO M185XTN01.2 is a normally white LCD, the screen luminance is measured with the LCD in the "Off" state (i.e. the pixels are not energized). This is the "white" state with the maximum possible luminance.





The "white" color displayed on the screen when the video signal is applied may have a slightly lower luminance. When the LCD is properly driven, the luminance of the "white" color displayed on the screen should be within 10% of the specified 1,250 nits.

The LMG257 LCD module has a high contrast ratio (CR) about 800:1 along the normal direction. This is the inherent CR measured in a dark room. As the ambient lighting level increases, the CR value drops due to reflection and glare at the front surface of the LCD.

Chromaticity

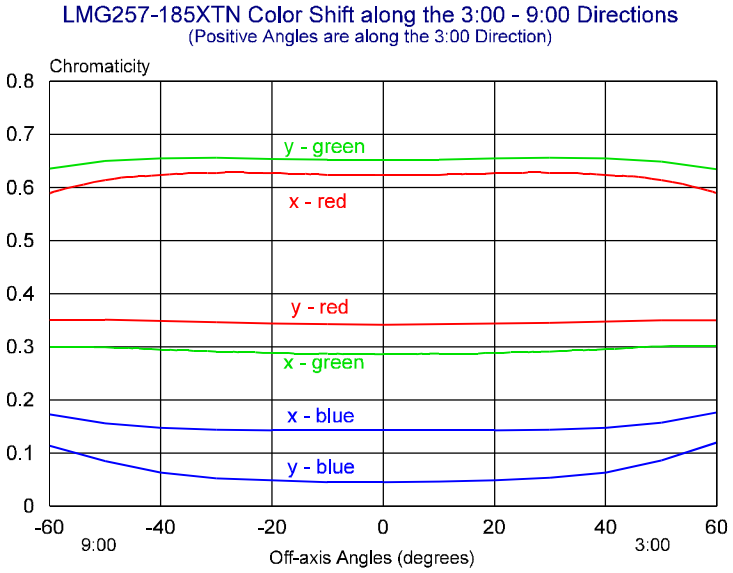
The 1931 CIE chromaticity coordinates of the R, G, B primary colors displayed on the screen are presented in the table on page 1. These numbers are measured from a viewing direction perpendicular to the LCD screen in a dark room.

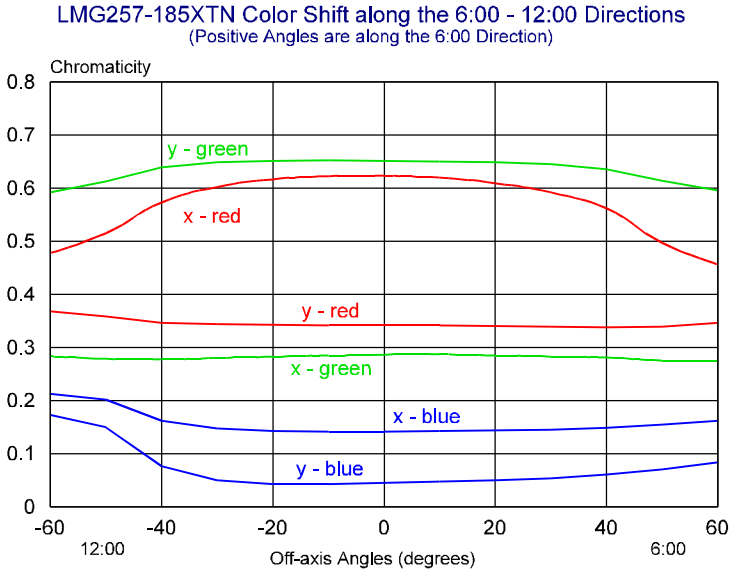
The figures on the next page present the chromaticity (x, y) data of the R, G, B primary colors versus the viewing angle.

Along the 3:00 to 9:00 (horizontal) directions, the chromaticity values do not change significantly. Thus the color shift along the horizontal directions is small.

Along the 6:00 to 12:00 (vertical) direction, the chromaticity values of the green primary colors have very small change. However, the red and the blue primary colors change toward the white

white color at off axis viewning angls beyond 40º, in particular along the 12:00 direction. As a result, at off axis viewing angles beyond 40º along the 12:00 direction, the color of the image displayed on the screen shifts toward greenish. Meanwhile, the image contrast ratio also drops down significantly.





LED Backlight Driving Specifications

The LCD module has a VHB backlight with two LED lamp strips.

Each LED strip has a JST BHRS-02VS-1 connector connecting to the LED drive board. The JST mating connector part number is SM02-BHSS-1-TB.

At the maximum screen brightness setting of 1,250 nits,

the driving conditions of each LED strip are,

LED strip driving voltage	43	Vdc (typ)
LED strip driving current	260	mA

Thus, the two LED strips consumes about 22.5 Watts. With Landmark's LD320 LED driving board (tuned for the LMG257-185XTN), the total power drain from the 12V supply is 27 Watts.

Backlight Life

The half brightness life of the VHB backlight in the LMG257-185XTN sunlight readable module is rated at 50,000 hours. The half brightness life is the number of operating hours before the backlight luminance (seen as the LCD screen brightness) drops down to 50% of its initial value.

The lifetime of an LED backlight is mainly determined by the luminous decay of the LEDs. As the temperature of the LED chip rises, the LED luminance decay accelerates. However, the decrease of the LED life due to the temperature effect on the LED life is relatively small if the ambient temperature is maintained below 50 ºC.

Thermal Management

At full screen brightness of 1,250 nits, each LED strip consumes about 11.2 Watts. This power is dissipated along the 410 mm width of the LCD. As a result, it will increase the temperature near the LED strip slightly but will not casue any major thermal management issues.

For outdoor display applications where the LCD may be subject to direct sunlight exposure, the LCD screen can absorb a large amount of solar heat. In the worst conditions, the heating power generated from strong sunlight exposure can reach 95 Watts, which is more than 4 times the LED backlight power. As a result, the LCD temperature can rise more than 40 ºC, particularly if there is a cover plate in front of the LCD.

Thus, for outdoor applications with direct sunlight exposure, the combined heating power from the sunlight and the LED backlight can raise the LCD temperature well beyond the 50º C maximum operating temperature of the LCD. As a result, the LCD may be black out with no images shown on the screen. Thus, it is necessary to implement some cooling measures to maintain the LCD temperature at 50 ºC or below to ensure the good display performances.

For outdoor applications in cold winter weather, the ambient temperature may drop to below -30^{o}C which exceeds the mininum operating temperature of the LCD. Therefore, the thermal management (cooling and heating) system should be designed according to the worst case conditions anticipated for the LCD to ensure that the LMG257 LCD will operate properly.

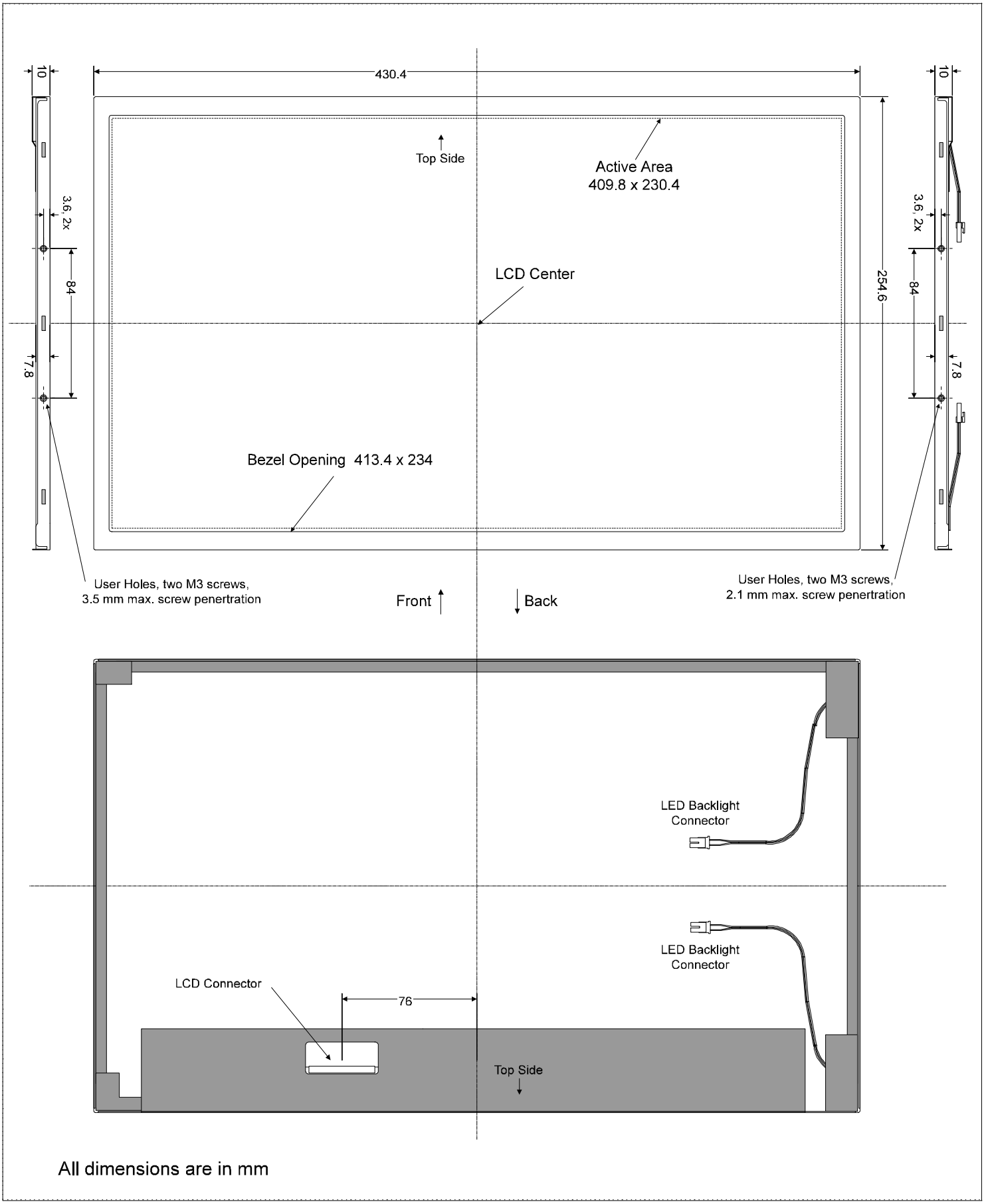
LCD Module Mechanical Dimensions

The mechanical dimensions of the LMG257-185XTN LCD module are shown on the next page. The drawing also shows the anode and cathode pins of the connectors to the LED strip.

The LMG257-185XTN is a side mount LCD module. There are four user mounting holes (2 on the left side and 2 on the right side). Please use four M3 screws to mount the LCD module onto the display case.

Caution:

At the right side of the LCD, the maximum depth of the M3 screws penetrating inside the LCD module is limited to 2.1 mm, and on the right side, it is limited to 3.5 mm. Using longer screws beyone these limits can cause severe damage to the LCD. The torque used to tighten the screws is 2.5 - 3.5 Kg-cm (2.2 - 3.0 lb-in).



All dimensions are in mm