Landmark Technology

LMG241-150X02TL

15" Sunlight Readable LCD Module

Introduction

The LMG241-150X02TL is a 15" Sunlight Readable LCD module. The module consists of an LG LB150X02-TL01 TFT color LCD panel and a VHB (very high brightness) LED backlight in a side mount package of less than 12 mm maximum thickness.

At the maximum backlight power of 17 Watts, the LMG241-150X02TL delivers a high screen brightness of 1,600 Cd/m^2 (nits). At this level, the display is highly 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	1,600	Cd/m^2	LCD displays the brightest white
Luminance Variation	±15% or better		Note 3
Backlight Power Consumption	18.5	Watts	Excluding LED driving board losses
Screen Dimming Ratio	20:1		With LD200A LED driving board
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	70	Degrees	Contrast ratio ≥ 10
9:00 o'clock direction	70	Degrees	Contrast ratio ≥ 10
6:00 o'clock direction	70	Degrees	Contrast ratio ≥ 10
12:00 o'clock direction	65	Degrees	Contrast ratio ≥ 10
LCD Screen Chromaticity (x, y)			
White	(0.321, 0.343)		Measured at the normal direction
Red	(0.594, 0.363)		Measured at the normal direction
Green	(0.345, 0.616)		Measured at the normal direction
Blue	(0.149, 0.066)		Measured at the normal direction
LCD Module Weight	1,030	Grams	
Display Resolution	1,024 x 768		
Operating Temperature Range	0 to 50	ºC	

Note 1: Please refer to the LG LB150X02-TL01 data sheet for detailed LCD electrical specifications and general precautions.

Note 2: All data are measured at $25^oC \pm 2^oC$ ambient temperature.

Note 3: Screen luminance is measured at 9-point positions as shown in the LG LB150X02-TL01 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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LED Backlight Driving Specifications

The LCD module has a VHB backlight with two LED lamp strips. Each LED strip has 48 white LEDs that are electrically connected into 6 strings in parallel. Each string has 8 LEDs connected in series.

Each LED strip is terminated with a JST 2-pin connector, BHRS-02VS-1. The JST mating connector part number is SM02-BHSS-1-TB.

At the maximum screen brightness setting of 1,600 nits, the driving conditions of each LED strip (with 6 strings) are,

LED strip driving voltage	25.6	Vdc (typ)
LED strip driving current	360	mA

Thus, the 2 LED strips in the backlight consume about 17 Watts. With Landmark's LD200A LED driving board (tuned for the LMG241-150X02TL), the total power drain from the 12V supply is 21.6 Watts.

Backlight Life

The half brightness life of the VHB backlight in the LMG241-150X02TL 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. This temperature effect on the LED life is relatively small if the LCD case temperature is maintained below 50 ºC.

Thermal Management

The backlight power consumption of the LMG241-150X02TL LCD module is approximately 17 Watts at full screen brightness. This is about 8.9 Watts higher than the backlight power consumption of the original LG LCD at 300 nits. So the LCD temperature increase due to this additional backlight power is not too much.

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 70 Watts, which is close to 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.

Since the LMG241-150X02TL has a very efficient LED backlight, in conditions with no direct sunlight exposure, thermal management can be accomplished with simple cooling fans.

For outdoor applications with direct sunlight exposure, the combined heating power from the sunlight and the VHB backlight can raise the LCD temperature possibly beyond 80^{o}C. Also, both LED efficiency in Lumens per Watt and LED life span decrease when the ambient temperature rises beyond a certain level. Thus, please remember to implement cooling measures to maintain the LCD temperature below 50 ºC to ensure good display performances and long backlight life span.

Thermal Management (continued)

For outdoor applications in cold winter weather, the ambient temperature may drop to below -30^{o}C. Therefore, the thermal management (cooling and heating) system should be designed according to the worst case conditions anticipated for the LCD to ensure sure that the LMG241 LCD with its LED backlight will operate properly.

LCD Module Mechanical Dimensions

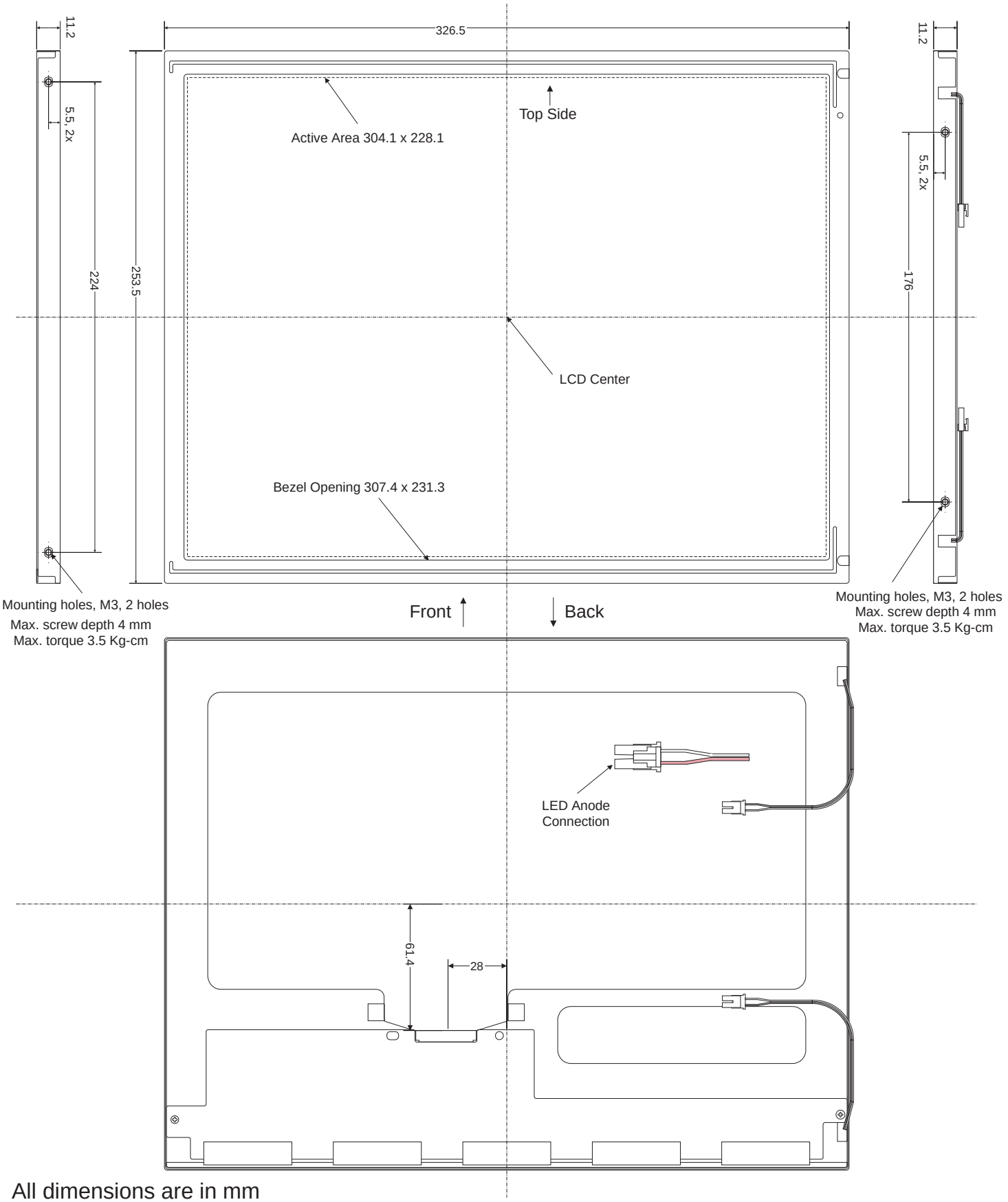
The mechanical dimensions of the LMG241-150X02TL LCD module are shown on the next page. The drawing also shows the pin assignments of the anode and cathode connections to the LED backlight.. .

The LMG241-150X02TL 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:

The maximum depth of the screws penetrating inside the LCD module is 4.2 mm. The torque used to tighten the screws is 2.5 - 3.5 Kg-cm (2.2 - 3.0 lb-in). Excessive torque and longer screws can cause severe damage to the LCD

LMG241-150X02-TL01 Mechanical Dimensions



All dimensions are in mm