

Introduction

LMG256-170EG01B is a 17" sunlight readable LCD module. The module consists of an AUO G170EG01 V1 TFT color LCD panel and a VHB (very high brightness) LED backlight to achieve a maximum screen brightness of 1,550 Cd/m² (nits). At this brightness, the power consumption of the LED backlight is only 25 Watts.

The LMG256-170EG01 LCD has 1,280 x 1024 resolution with a wide viewing angle around ±80° in horizontal direction. For applications in low lighting environments, the screen brightness can be adjusted down to less than 5 Cd/m² using a proper LED drive board with PWM (Pulse Width Modulation) dimming control.

Characteristics (Note 1, 2)

Parameters	Typical Value	Units	Conditions
LCD Screen Luminance	1,550	Cd/m ²	LCD in OFF state (normally White)
Backlight Power Consumption	25	Watts	At max. backlight brightness
Typical LCD Contrast Ratio	800:1		White vs. Black (measured in the dark at the normal direction)
Typical Viewing Angles			
3:00 direction	~ 80	Degrees	Contrast ratio ≥ 10
9:00 direction	~ 80	Degrees	Contrast ratio ≥ 10
6:00 direction	~ 80	Degrees	Contrast ratio ≥ 10
12:00 direction	~ 60	Degrees	Contrast ratio ≥ 10
LCD Screen Chromaticity (x, y)			Measured at the direction perpendicular to the LCD
White	(0.287, 0.342)		
Red	(0.630, 0.355)		
Green	(0.289, 0.666)		
Blue	(0.141, 0.042)		
Temperature Range			
Operating	-30 ~ 85° C		
Storage	-30 ~ 85° C		
LCD Module Weight	1,300	Grams	

Note 1: Please refer to AUO G170EG01 V1 LCD data sheet for detailed electrical specifications and the precautions of LCD handling..

Note 2: All data is measured at 25^o C ± 2^o C ambient temperature.

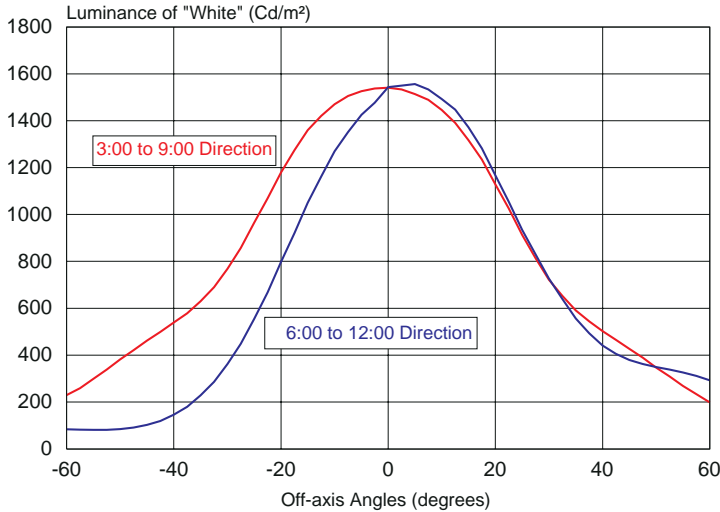
LCD Module Optical Performances

Luminance & Contrast Ratio

The typical LMG256-170EG01B LCD module screen luminance and contrast ratio at various viewing angles are

shown in the figures below. At the normal viewing direction, this LCD module delivers a very high Screen luminance of 1,550 Cd/m². Since this module 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 that provides the maximum possible luminance. The “white” color displayed on the screen when the video signal is applied may have a slightly lower luminance which can be caused by improper settings of the graphics card and/or the LCD controller. When the LCD is properly driven, the measured luminance of the “white” color displayed on the screen should be within 10% to the 1,550 nits.

LMG256-170EG01B Screen Luminance
Angular Distribution

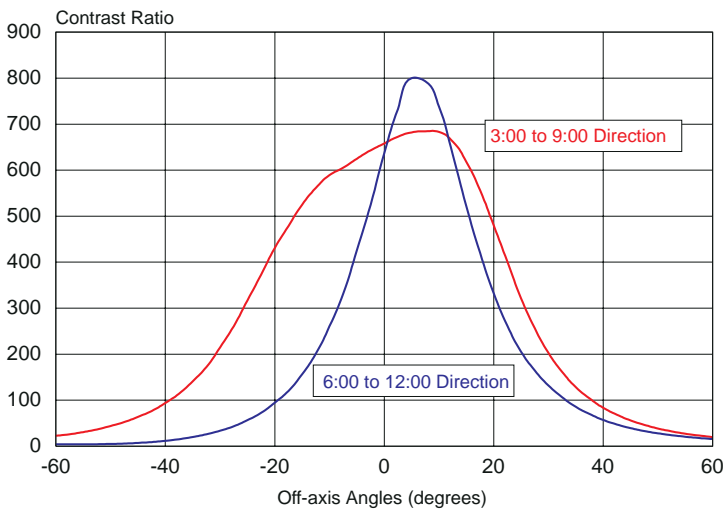


At the optimal viewing angle, the LMG256-170EG01B LCD module has a high contrast ratio (CR) of about 800:1. This is the inherent CR, which is the luminance ratio between the “White” and the “Black” states measured in a dark room. Under ambient lighting, particularly in bright outdoor environments, the CR value of the display drops significantly due to the reflection and glare caused by the strong ambient illumination. For details, please refer to Landmark Technote TK0101.

Chromaticity

The figures on the next page present the chromaticity (x, y) values of the R, G, B (Red, Green, Blue) primary colors displayed on the screen.

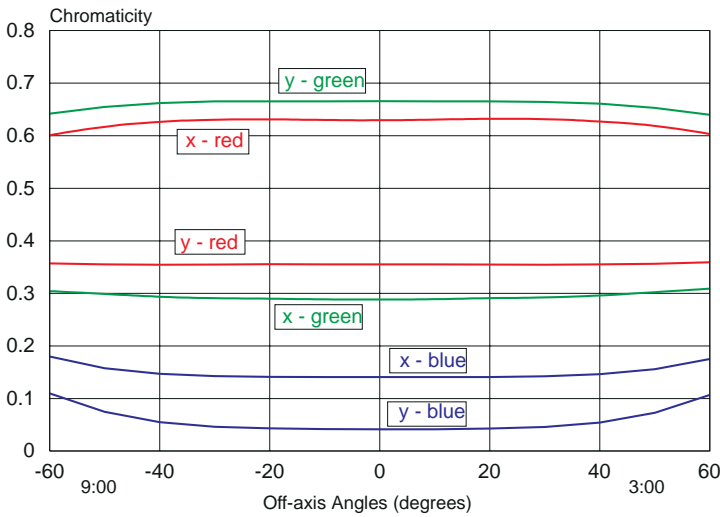
LMG256-170EG01B LCD Contrast Ratio
Angular Distribution



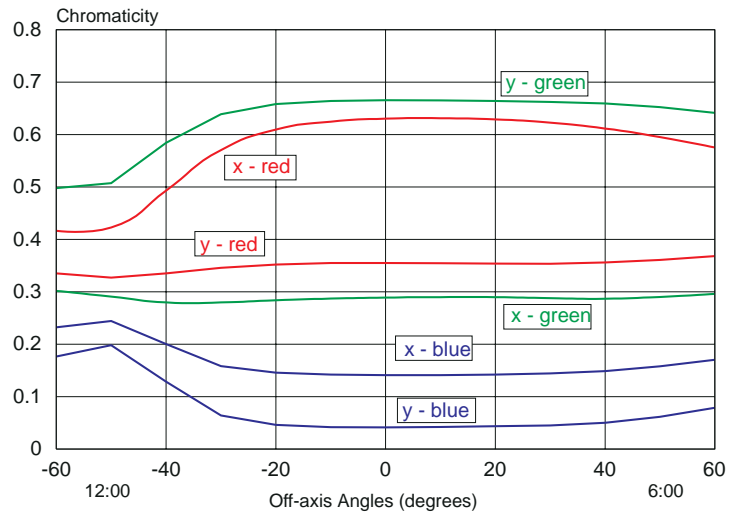
Along the 3:00 to 9:00 (horizontal) directions, the chromaticity values of the Red and Green primary colors virtually have no changes over the -60° to 60° viewing angle range. Only the Blue primary color shows some small color shift at large off-axis viewing angles.

Along the vertical directions, the chromaticity values have very small changes along the 6:00 direction. However, along the 12:00 direction, the chromaticity values shifts significantly when the viewing angles reach beyond 35 to 40 degrees. As a result, all the R, G, B primary colors shift toward the white color at large off-axis angles.

LMG256-170EG01B Color Shift along the 3:00 - 9:00 Directions
(Positive Angles are along the 3:00 Direction)



LMG256-170EG01B Color Shift along the 6:00 - 12:00 Directions
(Positive Angles are along the 6:00 Direction)



LED Backlight Driving Specifications

The LCD module has a VHB backlight with two LED lamp strips. 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 of 1,550 nits, the driving current for each LED strip is at 290 mA.

At this current level, the typical driving voltage is about 43.5V, and the power consumption of the 2 LED strips is about 25 Watts.

Landmark LD320 LED driver board can drive the LMG256-170EG01B LCD module. The LD320 provide a dimming from 1,550 nits to about 25 nits.

Thermal Management

At 1,550 nits screen brightness, the 25 Watts backlight power consumption of the LMG256-170EG01B LCD module is about 13 Watts more than the backlight power consumption of the original AUO LCD at 350 nits brightness. So the LCD temperature increase due to this VHB LED backlight is not very significant.

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 sunlight exposure can reach 95 Watts, which is nearly 4 times the LED backlight power. As a result, the LCD temperature can rise more than 40°C under certain conditions.

Since the AUO G170EG01 V1 LCD has a maximum operating temperature of 85°C, the thermal management issue to keep the LCD temperature below this level is relatively simple. For example, some cooling fans can be used to remove enough heat generated by the sunlight and keep the LCD temperature below 85° C. However, both the LED efficiency in Lumens per Watt and the LED life span decreases when the ambient temperature rises beyond a certain level. Thus, please implement cooling measures to maintain the LCD temperature below 60° C to ensure good display performance and long backlight life.

Backlight Life

The half brightness life of the VHB backlight in the LMG256-170EG01B LCD 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. The decrease of the LED life due to the temperature effect is relatively small if the ambient temperature is maintained below 60 °C.

LCD Mounting

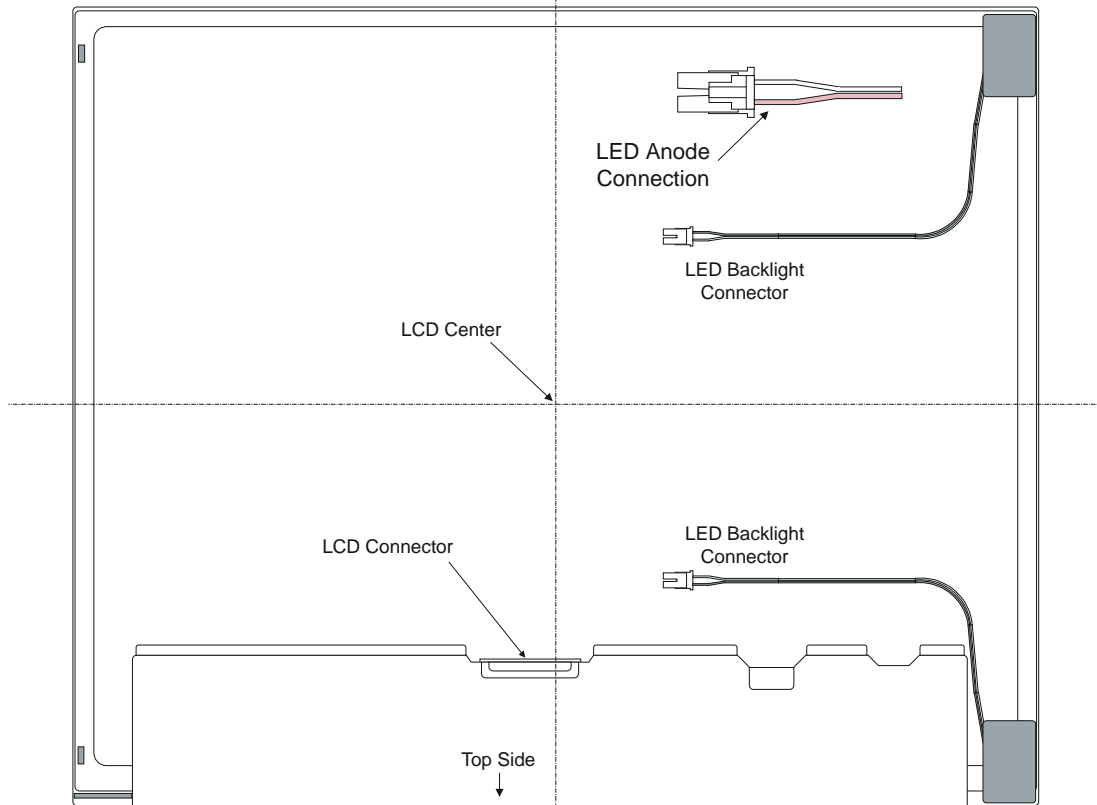
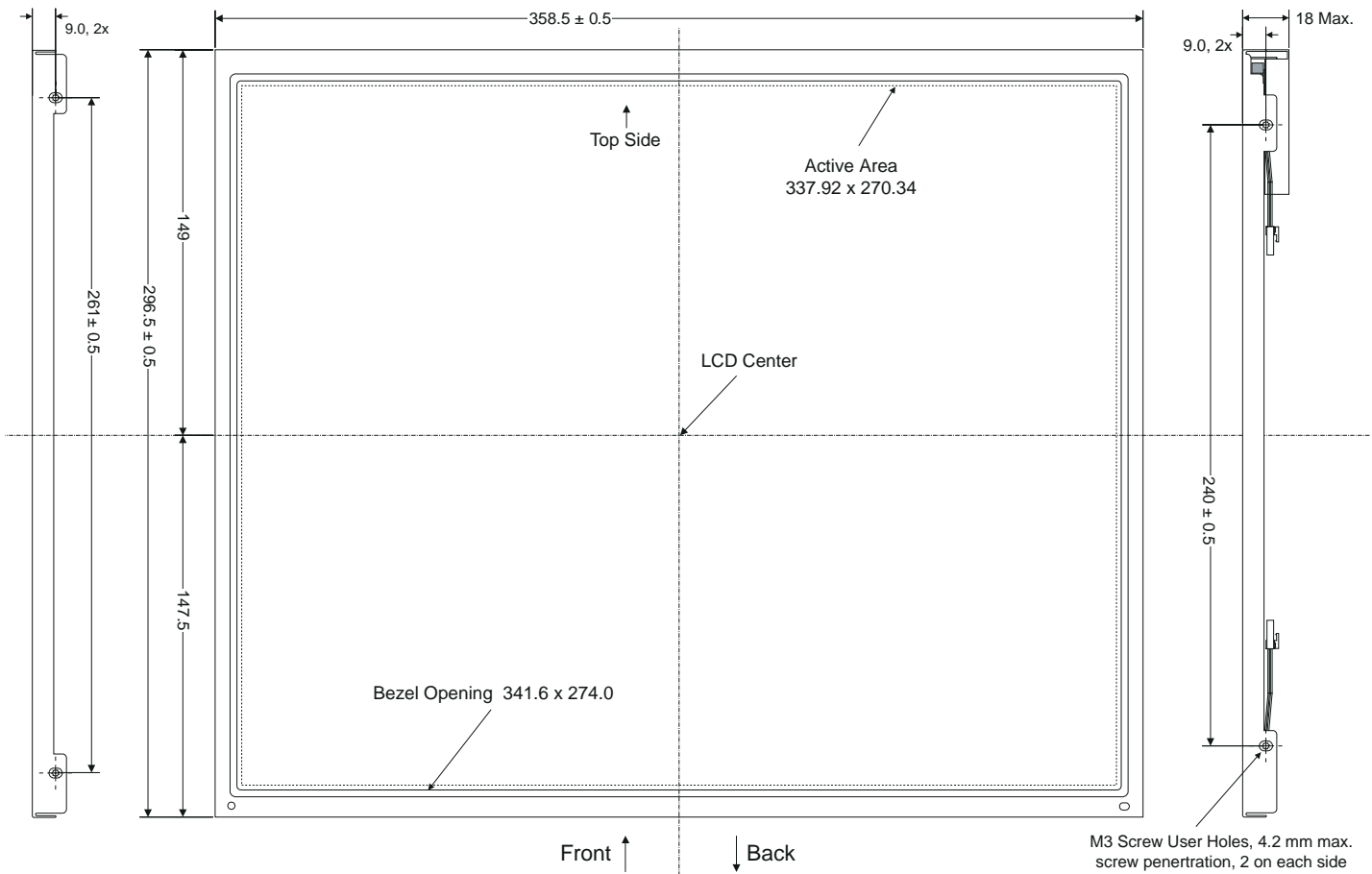
The LMG256-170EG01B is a side mount LCD module. Also, comparing to our earlier VHB LCD module, LMG223-170EG01, the LCD dimensions and the locations of the mounting holes are the same. Thus, this new module LMG256 will fit into the cases designed for the LMG223B.

The mechanical drawing on the next page shows the details of the dimensions and the locations of the mounting holes. Please use four M3 screws to mount the LMG256-170EG01B LCD module to the display case.

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All dimensions are in mm