

Introduction

The LMT270-104XA02 is a 10.4" sunlight readable LCD module with a PCAP touch screen. The LCD resolution is 1,024 x 768 (XGA). The module uses a VHB (very high brightness) LED backlight to achieve a screen luminance of 2,150 Cd/m² (nits). At this level, the backlight power consumption is about 18.5 Watts.

With 2,150 nits screen brightness, the display is highly readable under direct sunlight. Also, the operating temperature range of LMT270-104XA02 is from -20 to +70°C, making this LCD module suitable for demanding outdoor applications with multi-touch function.

Characteristics (Note 1, 2)

Parameters	Specification	Units	Conditions
LCD Screen Luminance	2,150	Cd/m ²	With the PCAP Touch Screen LCD in OFF state (normally White)
Luminance Uniformity	75% or better		Note 3
Backlight Power Consumption	18.5	Watts	Excluding LED driver board losses
Screen Luminance Dimming Ratio	20:1		With LD200A LED driving board
Typical LCD Contrast Ratio	520:1		White vs. Black (measured in the dark along the normal direction)
Typical Viewing Angles			
3:00 direction	> 70	Degrees	Contrast ratio ≥ 10
9:00 direction	> 70	Degrees	Contrast ratio ≥ 10
6:00 direction	> 60	Degrees	Contrast ratio ≥ 10
12:00 direction	> 60	Degrees	Contrast ratio ≥ 10
LCD Screen Chromaticity (x, y)			
White	(0.260, 0.300)		Measured at the normal direction
Red	(0.520, 0.330)		Measured at the normal direction
Green	(0.310, 0.575)		Measured at the normal direction
Blue	(0.135, 0.101)		Measured at the normal direction
PCAP Touch Function	Multi Touch		
PCAP Touch Interface	USB		
LCD Module Weight	820	Grams	

Note 1: Please contact Landmark for the detailed electrical specification of this LCD.

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

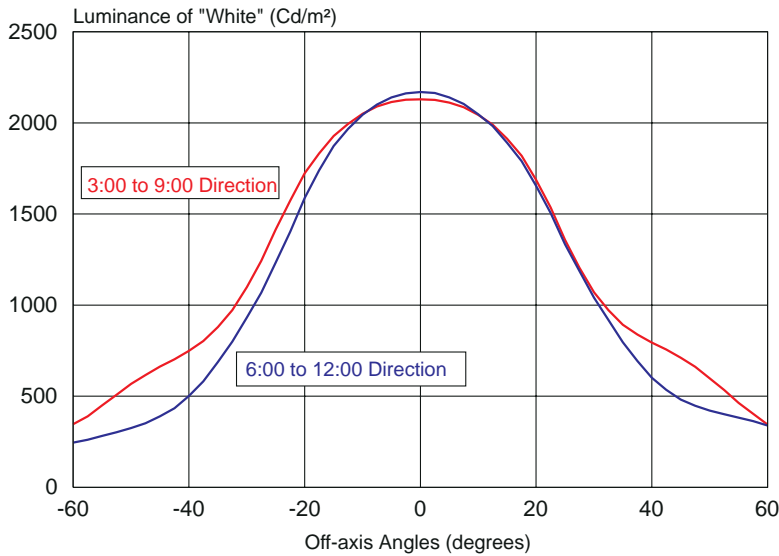
Note 3: Uniformity = (Lmin / (Lmax)) where Lmax (Lmin) is the maximum (minimum) luminance measured over the 5 points (the center point plus 4 points half way toward the corner) of the active area.

LCD Module Optical Performances

Luminance & Contrast Ratio

The typical LMT270-104XA02 LCD module screen luminance and contrast ratio are shown in the figures below: Since the LCD used in LMT270 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 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 measured luminance of the “white” color displayed on the screen should be within 10% of the specified value.

LMT270-104XA02 Screen Luminance
Angular Distribution



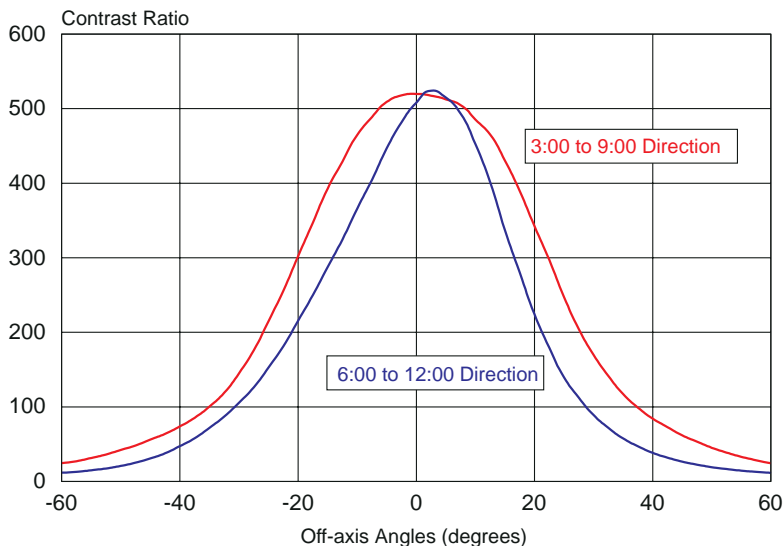
The LMT270-104XA02 LCD module has a contrast ratio (CR) about 520:1 along the normal viewing direction. This is the inherent CR measured in a dark room. As the ambient lighting level increases, the CR value drops due to the reflection and glare at the front surface of the LCD.

Chromaticity

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

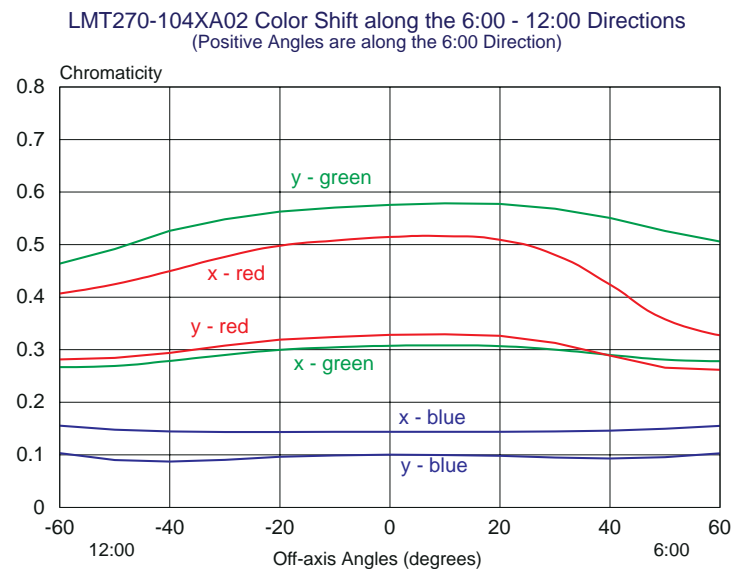
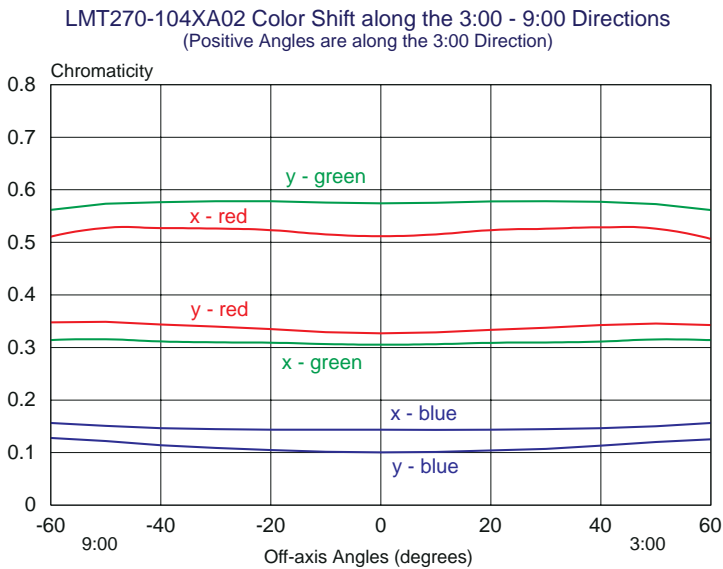
The figures on the next page present the chromaticity (x, y) data of the R, G, B primary colors displayed on the screen versus the viewing angle.

LMT270-104XA02 LCD Contrast Ratio
Angular Distribution



The chromaticity values have small changes along the 3:00 to 9:00 (horizontal) directions. As a result, the image displayed on the screen maintains a fairly good color along the horizontal viewing angles.

Along the 6:00 to 12:00 (vertical) directions, the red and the green primary colors have significant changes as the viewing angles reach 35° off axis, in particular, the red primary color along the 6:00 direction. Thus,, the image displayed on the screen has significant color changes beyond 40° off axis viewig angles along the 12:00 dirction and beyond 35° viewing angles along the 6:00 direction. .



LED Backlight Driving Specifications

The LMT270 LCD module has a SHB (super high brightness) backlight with two LED lamp strips. Each LED strip has 27 white LEDs that are electrically connected into 3 strings in parallel. Each string has 9 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 2,150 nits,

the driving conditions of each LED strip (with 6 strings) are,

- LED strip driving voltage 28 Vdc (typ)
- LED strip driving current 330 mA

Thus, the 2 LED strips in the backlight consume about 18.5 Watts. With Landmark’s LD200A LED driving board (tuned for the LMG216H), the total power drain from the 12V supply is 21.5 Watts.

Projected Capacitive Touch

Items	Symbol	Specification			Unit
		Min	Typ.	Max	
Power Supply Voltage	Vdd	4.8	5.0	5.2	V
Power Supply Current	Idd		32.2	45.1	mA
Output Threshold Voltage (High)	VOH	2.8			V
Output Threshold Voltage (Low)	VOL			0.8	V
Differential Input Sensitivity I(D+) - (D-)	VDI	0.2			V
Differential Input Common Mode Range	VCM	0.8		2.5	V
Power Consumption	PL		156	219	mWatt

Projected Capacitive Touch Connector Pin Assignments

Connector CN1 (JST S5B-PH-SM4TB)					
Pin #	Symbol	Function	Pin #	Symbol	Function
1	VDD	+5.0 V DC Input	4	GND	System Ground
2	D-	USB D-	5	NC	No Connection
3	D+	USB D+			

Thermal Management

The backlight power consumption of the LMT270 LCD module is about 18.5 Watts at 2,150 nits. As a result, the LCD temperature will be higher than normal. The exact increase of temperature depends on the installation of the LCD module in the equipment. When the LMT270 is operated at full brightness in open air without air flow, the LCD front surface temperature is about 20 to 25°C above the ambient temperature.

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 35 Watts. Since there is a touch panel in front of the LCD, most of this heat is trapped inside. With the combined power of about 54 Watts, the LCD can be heated beyond its 70°C maximum operating temperature. Also, 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.

For outdoor applications in very cold weather, the ambient temperature may drop below the -20° C minimum 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 LMT270 LCD with its LED backlight will operate properly.

LED Backlight Life

The half brightness life of the LED backlight in the LMT270 LCD module is rated at 50,000 hours. This is the number of operating hours before the backlight luminance drops down to 50% of its initial value.

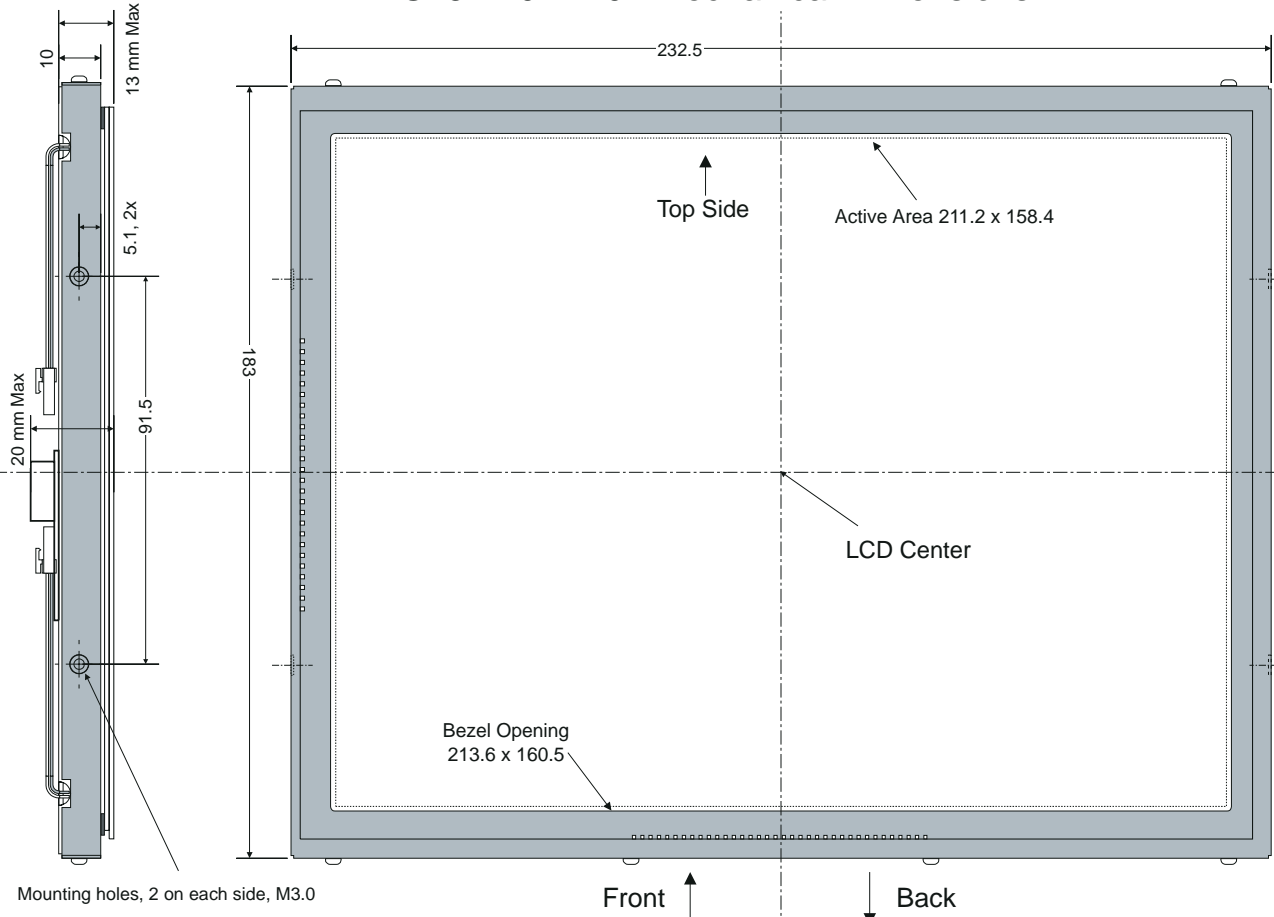
Also, as the temperature of the LED chip rises, the LED luminance decay accelerates. This temperature effect on the LED life is relatively small if the LCD case temperature is maintained below 50 °C.

Disclaimer

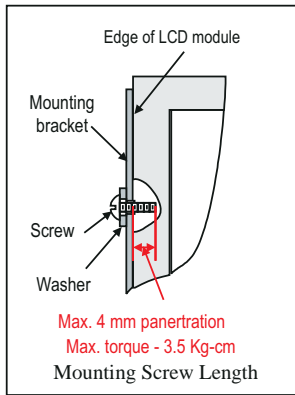
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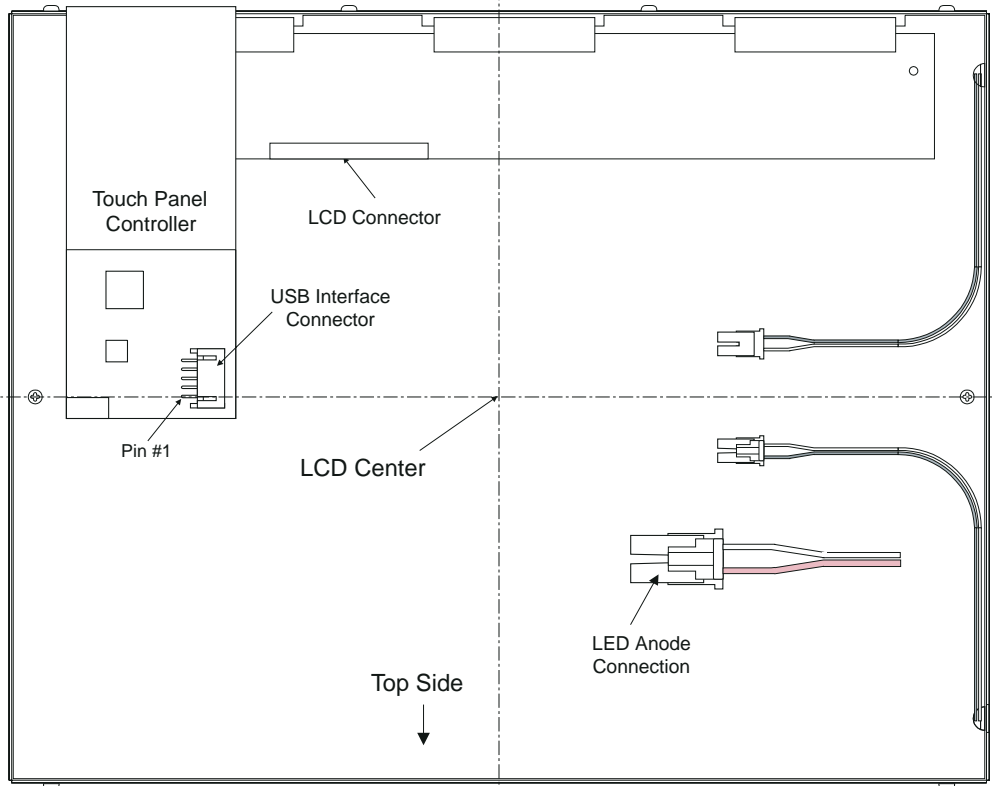
LMG252-104XA02 Mechanical Dimensions



Mounting holes, 2 on each side, M3.0



Warning:
Using a longer screw or tighten it with a torque exceeding 3.5 Kg-cm will damage the LCD module.



All dimensions are in mm