

#### Introduction

The LMT268-121X1 is a 12.1" 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 1,450 Cd/m<sup>2</sup> (nits). At this level, the LED backlight power consumption is about 9 Watts.

The LMT268 has a low reflective front surface. With 1,450 nits screen brightness, the display is highly readable under bright ambient lighting, including direct outdoor sunlight. Also, the ChiMei G121X1 is an industrial LCD with a wide operating temperature range from -30 to +80°C, making this LCD module specifically suitable for demanding outdoor applications with multi-touch function.

#### Characteristics (Note 1, 2)

Parameters	Specification	Units	Conditions
LCD Screen Luminance	1,450	Cd/m <sup>2</sup>	With the PCAP Touch Screen LCD in OFF state (normally White)
Luminance Uniformity	75% or better		Note 3
Backlight Power Consumption	9	Watts	Excluding LED driver board losses
Screen Luminance Dimming Ratio	50:1		With LD310 LED driving board
Typical LCD Contrast Ratio	900:1		White vs. Black (measured in the dark along 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	70	Degrees	Contrast ratio ≥ 10
12:00 direction	70	Degrees	Contrast ratio ≥ 10
LCD Screen Chromaticity (x, y)			
White	(0.288, 0.329)		Measured at the normal direction
Red	(0.614, 0.371)		Measured at the normal direction
Green	(0.310, 0.632)		Measured at the normal direction
Blue	(0.139, 0.081)		Measured at the normal direction
PCAP Touch Function	Multi Touch		
PCAP Touch Interface	USB		
LCD Module Weight	850	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.

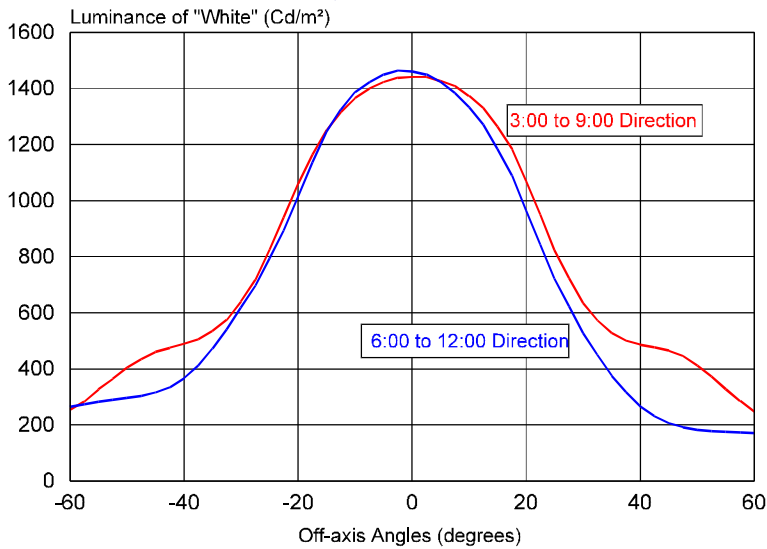
Note 3: Uniformity = (Lmin / (Lmax)) where Lmax (Lmin) is the maximum (minimum) luminance measured over the 5 points (the center point plus 4 points half way toward the corner) of the active area.

LCD Module Optical Performances

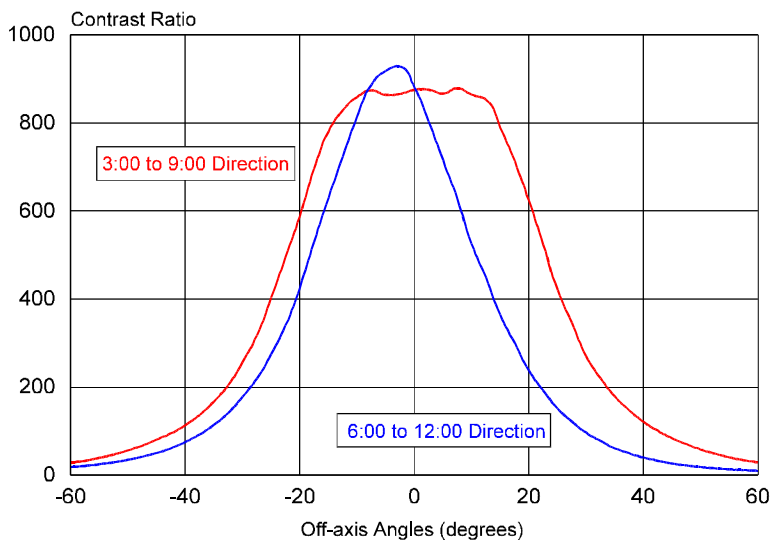
**Luminance & Contrast Ratio**

The typical LMT268-121X1 LCD module screen luminance and contrast ratio are shown in the figures below: The peak 1,450 Cd/m<sup>2</sup> brightness at the normal viewing direction is measured with the LCD in the “Off” state (i.e. the pixels are not energized). The “white” color displayed on the screen when the video signal is applied may have a slightly lower luminance which can be caused by improperly setting the LCD controller and/or the graphics card. 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.

**LMT268-121X1 Screen Luminance**  
Angular Distribution



**LMT268-121X1 LCD Contrast Ratio**  
Angular Distribution



The LMT268-121X1 LCD module also has a high contrast ratio (CR) of about 900:1 measured on axis. For all practical viewing angles, the CR value exceeds 50:1. These CR values are measured in a dark room. Under ambient lighting, particularly in bright outdoor environments, the CR value of the display drops significantly. Basically the front surface of the LCD reflects the ambient illumination. Thus, the luminance of the black color increases significantly which reduces the CR value. For details, please refer to Landmark Tecknote TK0101.

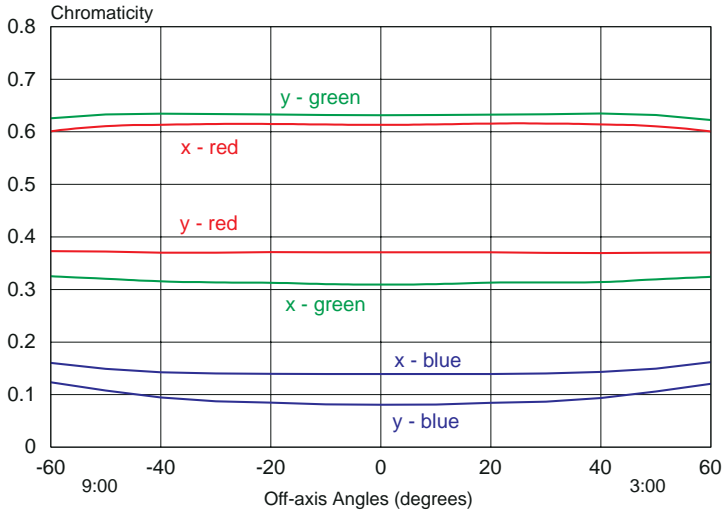
**Chromaticity**

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

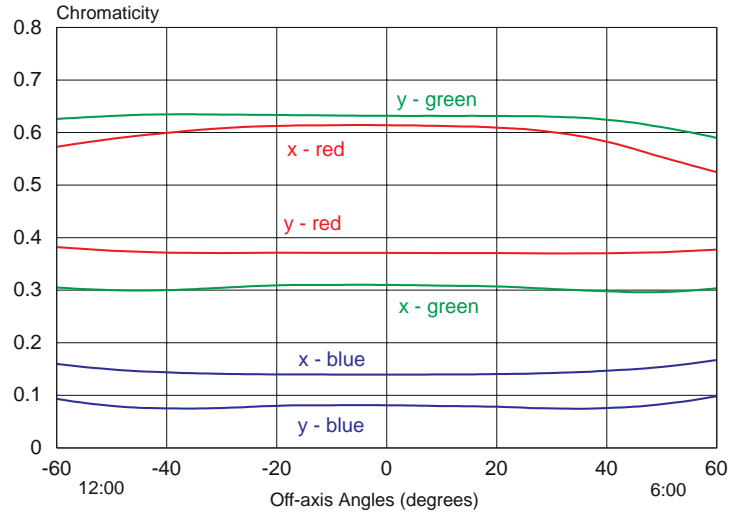
Along the 3:00 to 9:00 (horizontal) directions, the chromaticity values of the Red and Green primary colors virtually have no change. Only the Blue primary color shows a very slight color shift at large off-axis angles.

Along the 6:00 to 12:00 (vertical) directions, the chromaticity value changes are small. At very large off-axis viewing angles, the Red and Blue primary colors have minor color shifts toward the white. Therefore, the image displayed on the screen has only very small color shifts for all the practical off-axis viewing angles along all the directions.

LMT268-121X1 Color Shift along the 3:00 - 9:00 Directions  
(Positive Angles are along the 3:00 Direction)



LMT268-121X1 Color Shift along the 6:00 - 12:00 Directions  
(Positive Angles are along the 6:00 Direction)



### LED Backlight Driving Specifications

The LMT268 LCD module has a VHB backlight with one LED strip. The LED strip is terminated with a JST 2-pin connector, BHRS-02VS-1. The JST mating connector part number is SM02-BHSS-1-TB.

The driving voltage and current for the LED strip is listed below:

- LED strip driving voltage            33.3    V (typ)
- LED strip driving current            270    mA

At this driving condition, the backlight delivers 1,450 Cd/m<sup>2</sup> of LCD screen luminance with the PCAP touch screen.

The Landmark LD310 LED driver board can drive the LED strip at the rated 270 mA current. The LD310 can adjust the screen brightness down to less than 15 nits (100:1 dimming). At the full brightness of 1,450 nits, the total power from the 12V supply is about 10.5 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 Threshdold Voltage (High)	VOH	2.8			V
Output Threshdold Voltage (Low)	VOL			0.8	V
Differential Input Sensitivity I(D+) - (D-)I	VDI	0.2			V
Differential Input Common Mode Range	VCM	0.8		2.5	V
Power Consumption	PL		161	235	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 LMT268 LCD module is about 9 Watts at 1,450 nits. With this power, the LCD temperature increase is small and thus does not require any thermal management.

For outdoor display applications where the LCD may be subject to direct sunlight exposure, the major source of heat usually comes from sunlight. LCDs are suitable for outdoor applications because they have low reflective, black front surfaces. However, a black surface is a good solar energy absorber. For example, if strong sunlight shines on the display at a perpendicular direction, the LMT268 LCD module can absorb around 45 Watts of solar power. This is five times of the power consumption of the LED backlight. Since there is a touch panel in front of the LCD, most of this heat is trapped inside and can cause a significant rise of the LCD temperature rapidly.

However, LMT268-121X1 LCD has an operating temperature range from -30 to 80°C, which reduces the thermal management issue. Some cooling fans can be used to maintain the LCD temperature in the operating temperature range. However, both the LED efficiency (in Lumens per Watt) and the LED life span decrease 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 -30° C. Therefore, the thermal management (cooling and heating) system should be designed according to the worse case conditions anticipated for the LCD to ensure that the LMT268 LCD with its LED backlight will operate properly.

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LMT268-121X1 Mechanical Dimensions

