

Introduction

The LM238-320WXN is a 31.5" high bright LCD module specifically designed for digital signage applications. The module contains an LG LC320WXN LCD with a Landmark very high brightness (VHB) backlight and a set of inverters to run the VHB backlight. At the full brightness setting, the screen luminance reaches 1,400 nits - three times the brightness of standard 32" LCD TVs. It also has an extremely high contrast ratio of 1,100:1.

The LM238 module has 1,366 x 768 native resolution. At 1,400 nits brightness, the image on the screen matches the superb quality of traditional advertising signs that use light boxes behind color transparencies. In addition, the color of the white is balanced closely to that of a traditional backlit sign.

The inverters that operate the LM238-320WXN VHB backlight require 24V DC input. The 24V power supply should be able to deliver a minimum of 7 Amperes in order to run the LCD at the maximum brightness.

Electrical & Optical Characteristics (notes 1, 2, 3)

Parameters	Typical Value	Units	Conditions
LCD Screen Luminance	1,400	Cd/m ²	LCD displays the brightest White
Luminance Variation	±15% or better		Note 3
Backlight Power Consumption	135	Watts	Excluding inverter losses
LCD Luminance Dimming Ratio	20:1		With BI520 / BI522 inverter set
Typical LCD Contrast Ratio	1,100:1		White vs. Black (measured in the dark along the normal direction)
Typical Viewing Angles			
3:00 direction	89	Degrees	Contrast ratio ³ 10
9:00 direction	89	Degrees	Contrast ratio ³ 10
6:00 direction	89	Degrees	Contrast ratio ³ 10
12:00 direction	89	Degrees	Contrast ratio ³ 10
LCD Screen Chromaticity (x, y)			
White	(0.318, 0.354)		Measured at the normal direction
Red	(0.635, 0.343)		Measured at the normal direction
Green	(0.282, 0.620)		Measured at the normal direction
Blue	(0.142, 0.069)		Measured at the normal direction
LCD Module Weight	5.7	K Grams	With Inverters and the cover

Note 1: Please refer to LG LC320WXN LCD Specification for LCD electrical specifications & general precautions.

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

Note 3: Screen luminance is measured at 5 points as shown in the LG LC320WXN LCD data sheet. The luminance variation is the percent deviation of the maximum and minimum values measured versus the average luminance value of the 5 points.

Luminance, Contrast Ratio, Chromaticity, & Color Shifts

The luminance, contrast ratio (CR), and the chromaticity values (x, y) in the table are all measured at the on-axis viewing direction. As the viewing direction shifts to off-axis angles, both the luminance and contrast ratio drops. However, the chromaticity (x, y) values of the R, G, B primary colors do not change at off axis angles since this is a normally black wide viewing angle LCD module.

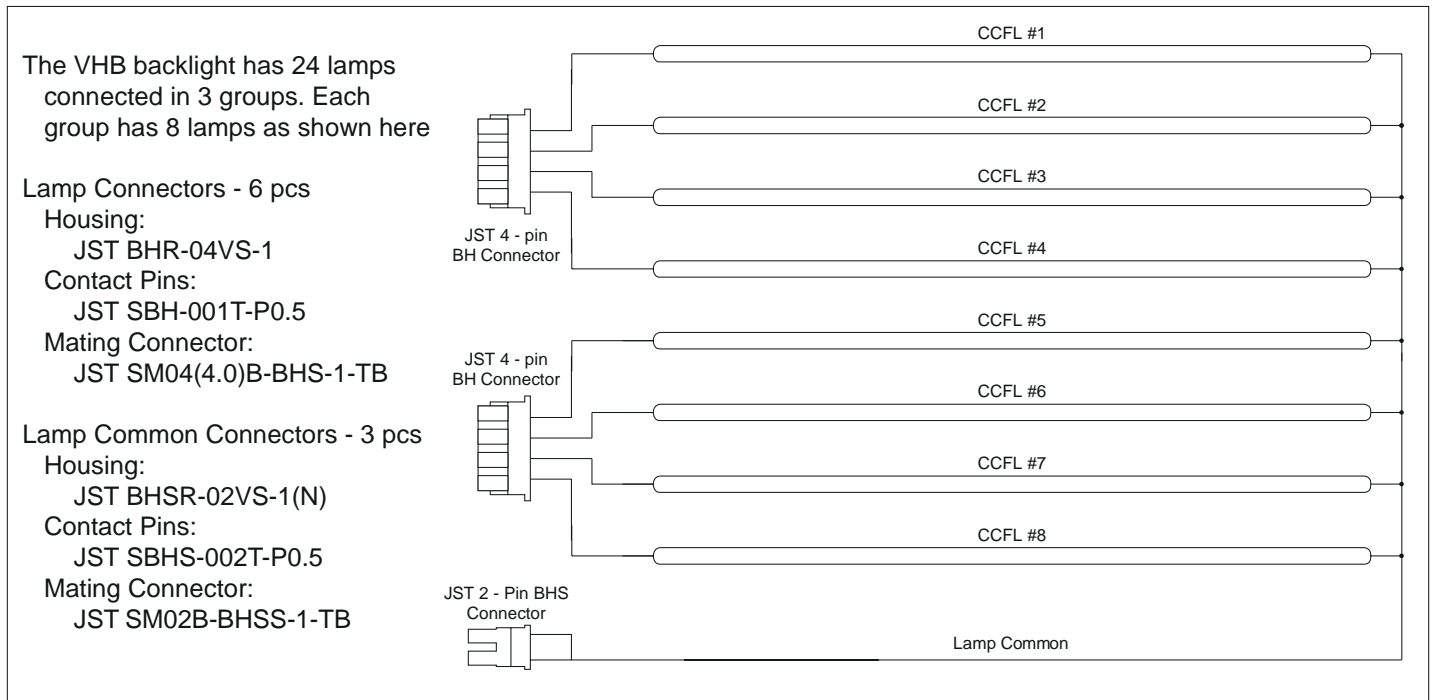
The LM238-320WXN LCD module has a high contrast ratio (CR) of 1100:1. This is the inherent CR, which is the luminance ratio between the “White” and the “Black” states measured in a dark room. Under ambient lighting, particularly in bright outdoor environments, the CR value of the display drops significantly due to the reflection and glare caused by strong ambient illumination at the front surface of the display.

Inverters to Drive the LM238-320WXN VHB Backlight

The LM238-320WXN high bright LCD module has a VHB backlight with 24 cold cathode fluorescent lamps (CCFLs). The lamps are electrically connected into three groups. Each group has 8 lamps connected as shown in the following figure. The lamps are connected at one side to two JST 4-pin connectors. The other side of the lamps are tied together into a lamp common connection. A JST 2-pin connector is used to provide redundant connections for the lamp common.

The entire LM238-320WXN VHB backlight has 6 JST 4-pin connectors for 24 lamps and 3 JST 2-pin connectors for the 3 lamp commons. The part numbers of the connectors and their mating connectors are listed in the figure below.

The VHB backlight is operated with two Landmark inverters in a master and slave configuration. The master inverter BI520A operates two groups of lamps (16 lamps) and has the dimming and the backlight On/Off control.



The slave inverter BI522A operates one group of 8 lamps. It receives a signal from the BI520A master inverter for dimming and On/Off controls. For interconnections of the inverters, please refer to the BI520A and BI522A data sheets.

The long CCFLs in this 32" LCD module require a starting voltage greater than 2,000 Vrms. This high voltage is extremely dangerous. To protect the users, the high voltage areas of the inverters are fully shielded with a metal cover. If any service work is performed that requires removal of the metal cover, please do not touch any exposed

metal parts that may carry the high voltage. Please refer to the BI520A and BI522A data sheets for the high voltage locations on the inverter boards.

The inverters run on 24 V DC input. At the full LCD screen luminance setting, the current input to the inverters is about 7 Amperes. At this level, the LCD screen luminance (brightness) will be at 1,400 nits. With proper dimming signal input, the brightness can be adjusted down to below 100 nits. Correspondingly, the lamp current and the input current to the inverter reduce in proportion to the brightness.

Backlight Life

The LM238-320WXN VHB backlight uses CCFLs with 50,000 hours of rated half brightness life. The half brightness life is the number of operating hours before the CCFL surface luminance drops down to 50% of its initial value. The half brightness life is specified at a given lamp current (typically at 5 mA). Driving the CCFLs at a lower lamp current increases the half brightness life. Conversely, over driving the CCFLs to a higher current reduces the half brightness life.

At the rated LCD screen luminance of 1,400 nits, the CCFLs in the backlight are driven at a lamp current slightly higher than the rated value. Therefore, the half brightness life of the lamp should be slightly lower than 50,000 hours. In addition, the brightness of a backlight (and so the LCD screen brightness) decays slightly faster than that of a CCFL due to the aging of other materials in the backlight. Even with these consideration, the actual operating half brightness lifetime of the backlight in this LCD module is expected to reach 50,000 hours and beyond, in particular, if the LCD screen luminance is adjusted (or dimmed) down during night time. For detailed descriptions on backlight life issues and actual test data on Landmark Technology backlights, please refer to Technical Note TK801 on Landmark website.

Thermal Management

The total backlight power consumption of the LM238-320WXN LCD module including the inverter losses is about 165 Watts at 1,400 nits screen brightness. This is about 1.5 time the backlight power of the original LG LC320WXN LCD at the maximum screen brightness of 500 nits. As a result, the LM238 LCD module temperature will be higher by about 5 - 6°C than the temperature of the original LG LCD running at 500 nits.

The exact increase in temperature depends on the installation of the LCD module in the equipment. In open air, the LCD module can be operated at 1,500 nits without any cooling. However, when it is installed in a case, some type of cooling measure should be implemented to ensure that the LCD temperature stays within the 0 to 50°C range specified in the data sheet of the LG LC320WXN.

For outdoor display applications where the LCD may be subject to direct sunlight exposure, the major source of heat usually comes from sunlight exposure. LCDs are suitable for outdoor applications because they have a low reflective, black front surface. However, a black surface is a good solar energy absorber. For example, if strong sunlight shines on the LM238-320WXN LCD module at a perpendicular direction, the LCD module can absorb up to 300 Watts of solar power. This is nearly twice as much as the maximum power consumption of the VHB backlight with the inverter loss. As a result, the LCD temperature can rise very quickly beyond its maximum tolerance level.

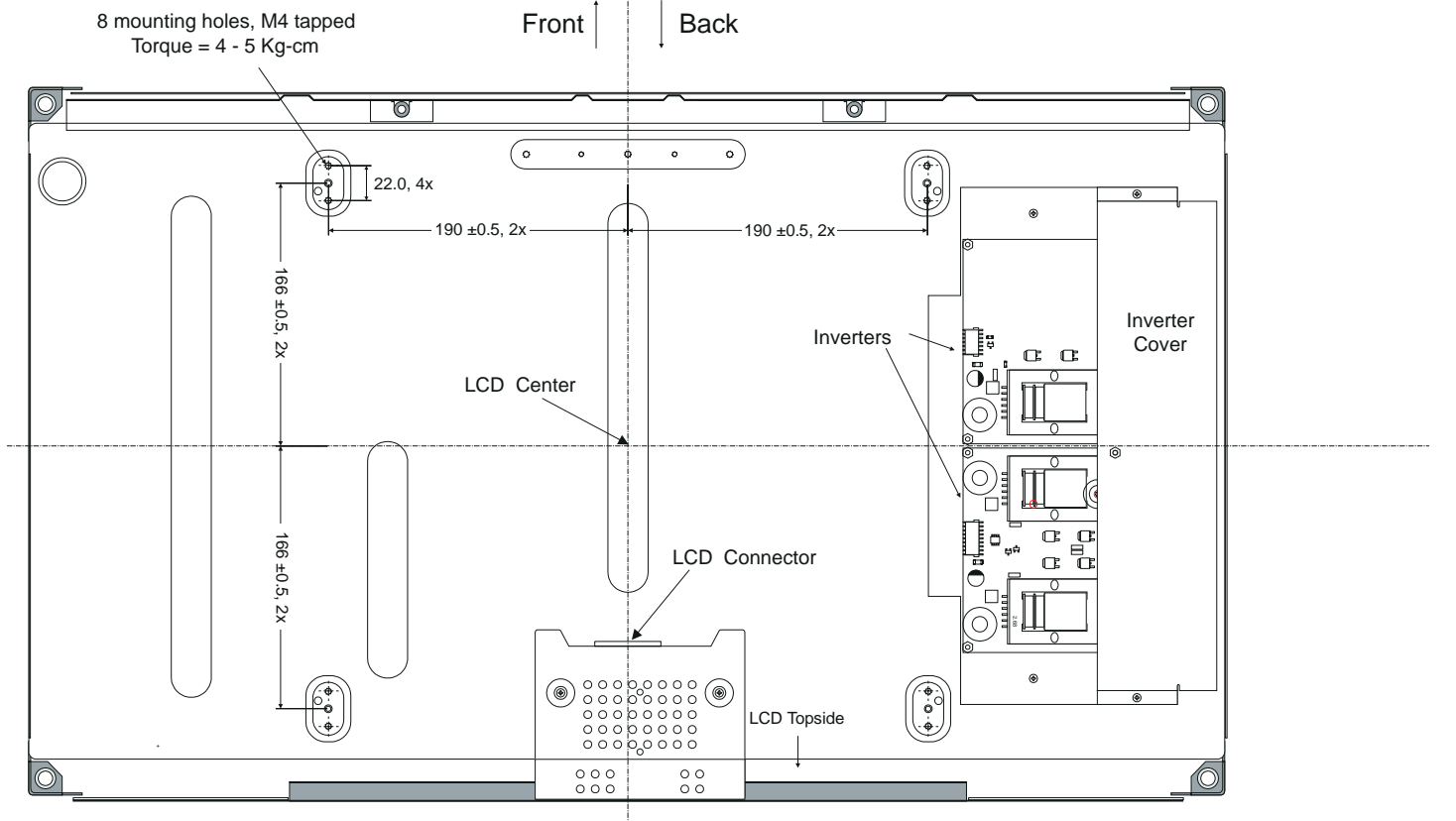
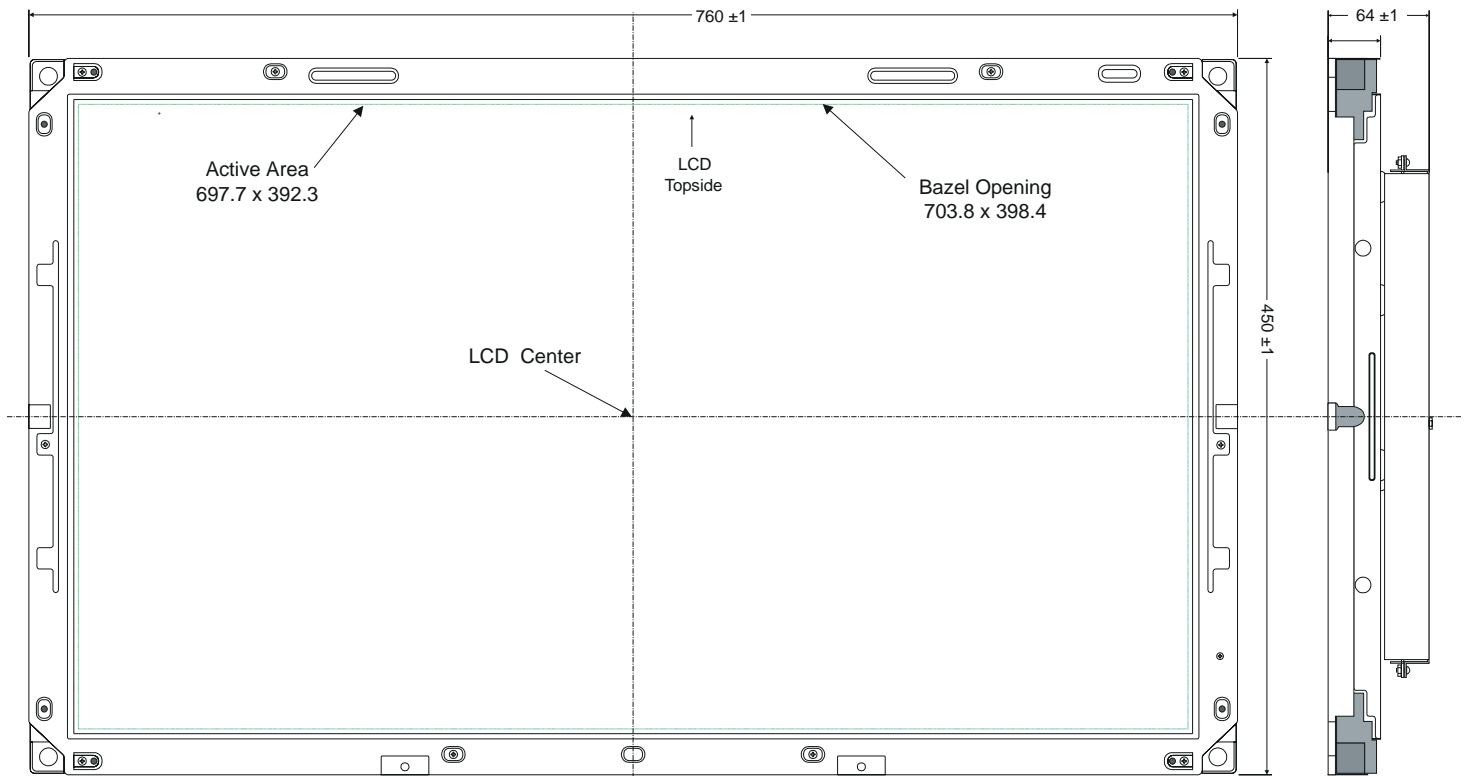
It is recommended that the LCD screen temperature be measured at full brightness, in the equipment, under actual operating environments. The cooling measure should then be designed accordingly. Please ensure that the specified maximum LCD temperature is not exceeded.

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LM238-320WXN Mechanical Dimensions



All dimensions are in mm