Landmark Technology

LM225-315AA02 -32" High Bright LCD Module for Digital Signage

Introduction

The LM225-315AA0202 is a 31.5" high bright LCD module specifically designed for digital signage applications. The module contains a Samsung LTI320AA02 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 1,350 nits - two and half times the brightness of standard 32" LCD TVs. It also has an extremely high contrast ratio of 1,700:1.

The LM225 module has 1,366 x 768 native resolution. At 1,350 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 LM225-315AA02 VHB backlight require 24V DC input. In addition, the Landmark MG22 LCD controller card that run the LM225 requires a 12V DC power supply.

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

Parameters	Typical Value	Units	Conditions
LCD Screen Luminance	1,350	Cd/m ^{2}	LCD displays the brightest White
Luminance Uniformity	20% or better		Note 3
Backlight Power Consumption	130	Watts	Excluding inverter losses
LCD Luminance Dimming Ratio	20:1		With BI520 / BI522 inverter set
Typical LCD Contrast Ratio	1,700:1		White vs. Black (measured in the dark along the normal direction)
Typical Viewing Angles			
3:00 direction	> 85	Degrees	Contrast ratio . ? 10
9:00 direction	> 85	Degrees	Contrast ratio ? 10
6:00 direction	> 85	Degrees	Contrast ratio ? 10
12:00 direction	> 85	Degrees	Contrast ratio ? 10
LCD Screen Chromaticity (x, y)			
White	(0.313, 0.366)		Measured at the normal direction
Red	(0.637, 0.348)		Measured at the normal direction
Green	(0.276, 0.624)		Measured at the normal direction
Blue	(0.143, 0.074)		Measured at the normal direction
LCD Module Weight	6,800	Grams	With Inverters and their cover

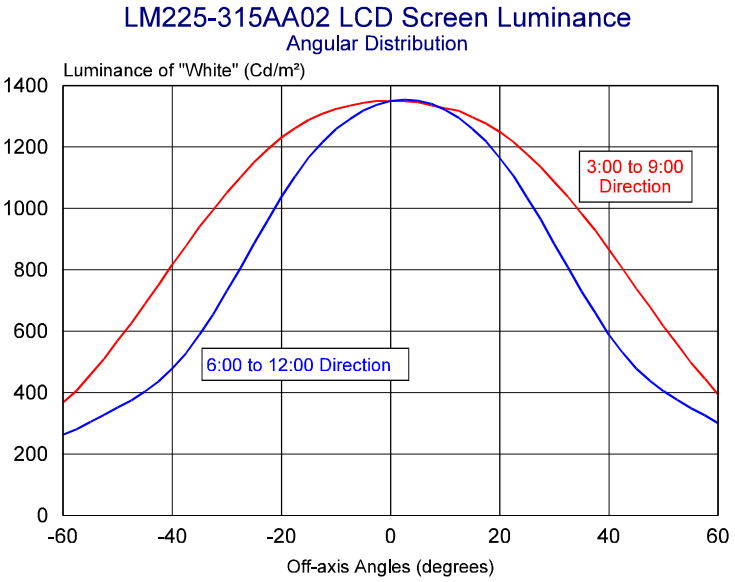
Note 1: Please refer to Samsung LTI320AA02 LCD Specification for LCD electrical specifications & general precautions.

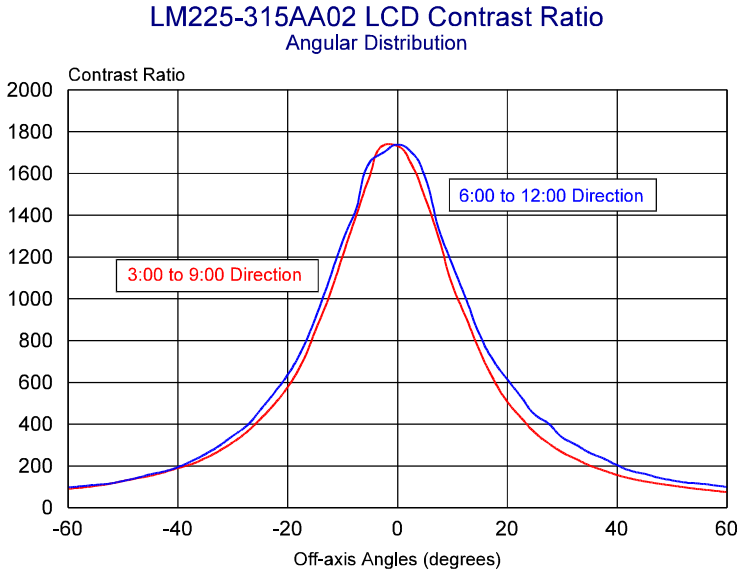
Note 2: All data is measured at 25º C ± 2ºC ambient temperature.

Note 3: Uniformity = (Lmax - Lmin) / (Lmax + Lmin) where Lmax (Lmin) is the maximum (minimum) luminance measured using a 10 mm diameter meter aperture over the LCD active area, except the last 10 mm area from the edges.

Luminance & Contrast Ratio

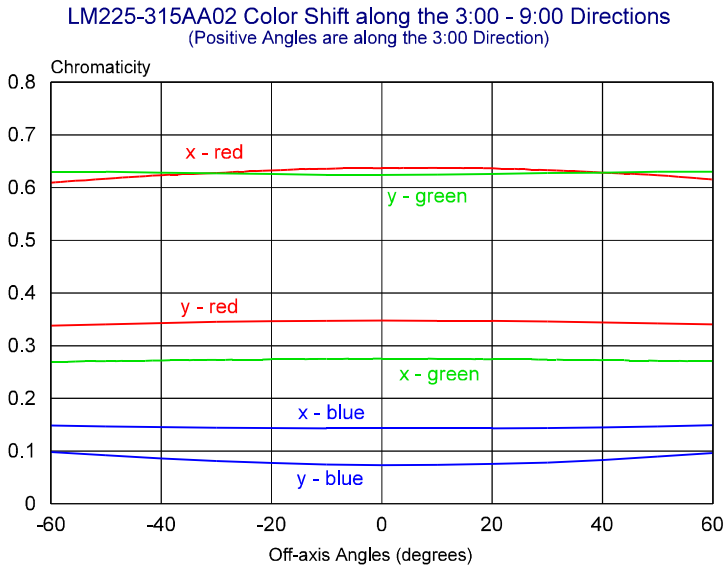
The following two figures show the luminance and the contrast ratio of the LM225-315AA02 LCD module. At the on-axis viewing direction, this LCD module has an extremely high contrast ratio (CR), over 1,700:1. This is the inherent CR, which is the luminance ratio between the "White" and the "Black" states 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.

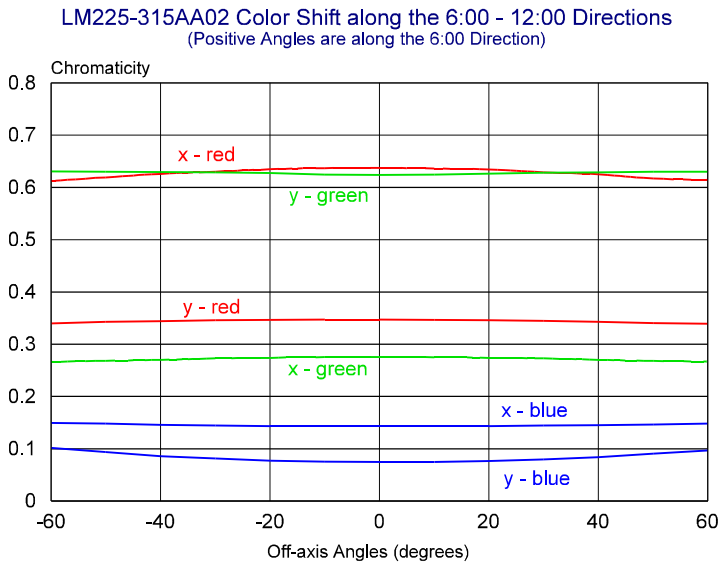




Chromaticity & Color Shifts

LM225-315AA02 is an LCD module that has a very wide viewing angle without much color shift. The figures below present the chromaticity (x, y) data of the R, G, B primary colors displayed on the screen. As the viewing direction moves toward off-axis angles, there are virtually no color shifts to ±60 degrees.





Inverters to Drive the LM225-315AA02 VHB Backlight

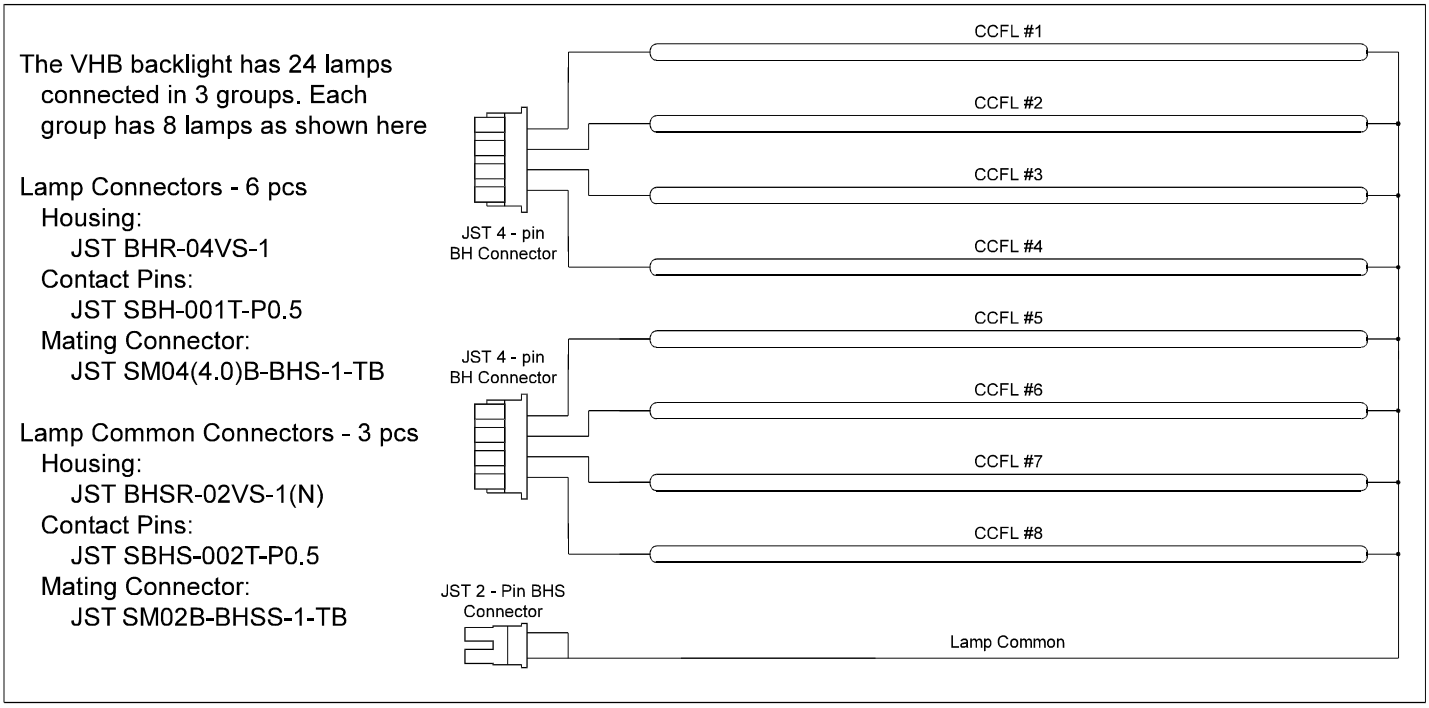
The LM225-315AA02 high bright LCD module has a VHB backlight with 24 cold cathode fluorescent lamps (CCFLs). The lamps are electrically connected into three groups. Each group has 8 lamps connected as shown in the following figure. The lamps are connected at one side to two JST 4-pin connectors. The other sides 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 LM225-315AA02 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 6.5 Amperes. At this level, the LCD screen luminance (brightness) will be at 1,350 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 LM225-315AA02 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 1,350 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 power consumption of the LM225-315AA02 LCD module including the inverter losses is about 155 Watts at 1,350 nits screen brightness. This is 70% higher than the power of the original backlight at the maximum LCD screen brightness of 450 nits. As a result, the LCD module temperature will be higher than normal.

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 1,350 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 50ºC range specified in the data sheet of the Samsung LTI320AA02 LCD.

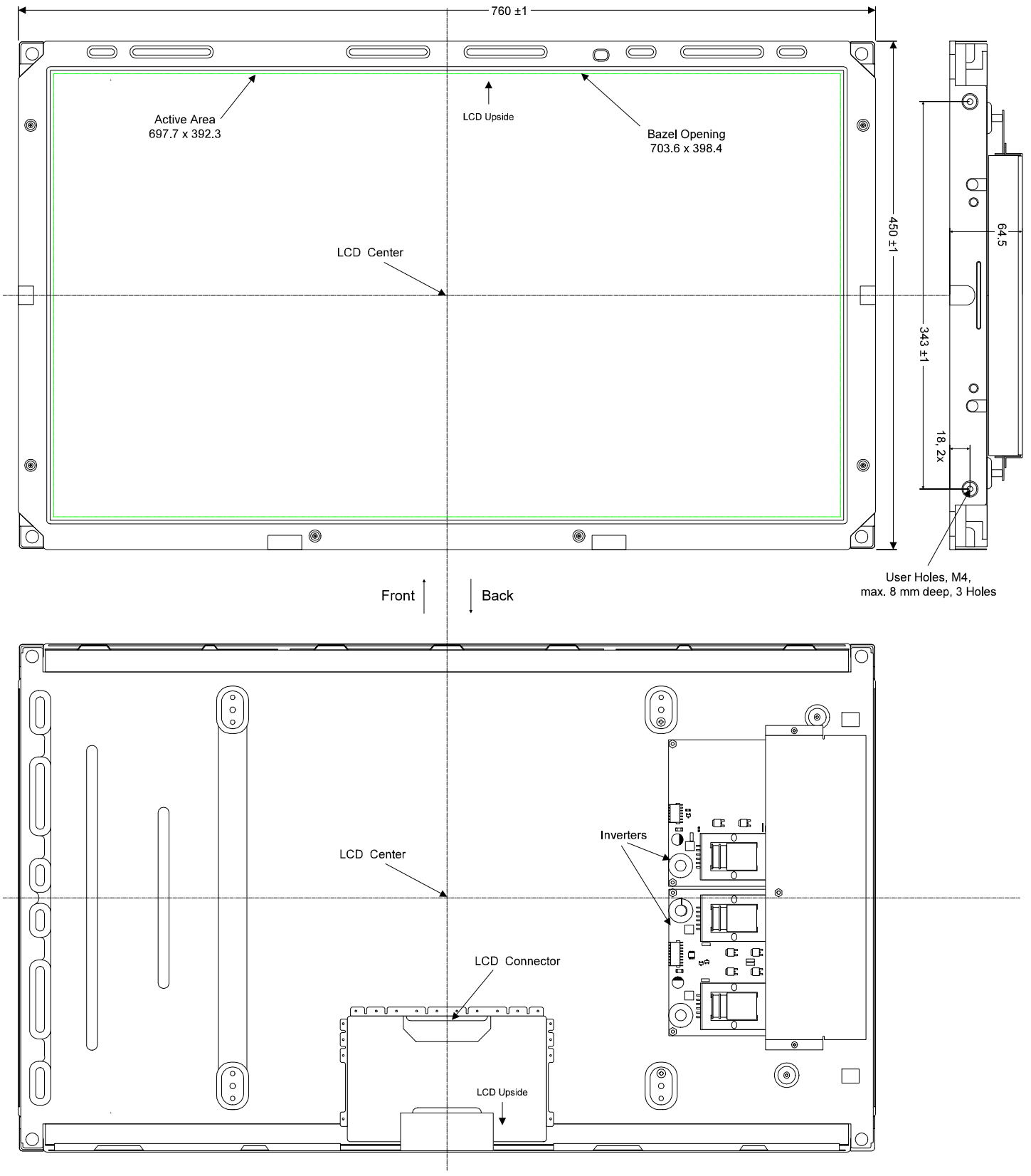
For outdoor display applications where the LCD may be subject to direct sunlight exposure, the major source of heat usually comes from sunlight. LCDs are suitable for outdoor applications because they have a low reflective, black front surface. However, a black surface is a good solar absorber. For example, if strong sunlight shines on the LM225-315AA02 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.

Disclaimer

Landmark Technology Inc. reserves the right to make changes to this document and the product which it describes without notice. In addition, Landmark Technology Inc. shall not be liable for technical or editorial errors or omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance, and use of this product.

This product shall not be used for or in connection with equipment that requires an extremely high level of reliability, such as military and aerospace applications, telecommunication equipment, nuclear power control equipment and medical or other life support equipment. Landmark Technology Inc. takes no responsibility for damage caused by improper use of this product which does not meet the conditions for use specified in this specification sheet.



All dimensions are in mm