

Landmark Technology is introducing VHB LCD Modules with LED backlights

After completing 5,500 hours of life testing on our first manufacturing prototype 12.1" LCD module with an LED backlight, Landmark Technology has established the confidence to introduce a family of VHB LCDs with LED backlights. These LCDs use the state of the art LED technologies to achieve a very high screen brightness with the minimum amount of power consumption. The VHB LCDs using LED backlights to be introduced range from 6.4" to 15" sizes.



Fig. 1. The LM203-121SN01 VHB LCD Module

The first set of VHB LCDs in this new family going into manufacturing are listed below:

Part Number	Size	Resolution	Screen Brightness	Backlight Power
LMG203-121SN01	12.1"	800 x 600	1,600 nits	13 Watts
LMG207-121X1	12.1"	1024 x 768	1,500 nits	13 Watts

Note: The backlight power is the total power going into the driving board

The Progresses that paved the way for the Arrival of the VHB LED Backlights

Landmark started a 12.1" LED backlight development in June 2001. By Nov. 2001, we put the first LCD using an LED backlight together with a 15" CPT LCD CLAA150XA03. This LCD was also used in our LM117 VHB LCD module with a CCFL backlight. Thus, we could compare their performances side by side.

The 15" LCD with the LED backlight consumed 79.2 Watts at a screen brightness of 1,164 nits. In the meantime, our standard LM117 VHB LCD with a CCFL backlight consumed 48 Watts at a screen brightness of 1,531 nits. So the CCFL backlight was 220% better in brightness versus power performance than the LED backlight. The test data showed that the VHB LED backlight era was not here yet.

In early 2002, we put an 8.4" LED backlight together to be used with the Toshiba 8.4" LCD LTM08C351. The backlight had good brightness uniformity. The light strip used R, G, B LEDs. Thus, the color gamut of the image displayed on the screen was great.

However, we observed that the backlight brightness dropped from 4,500 nits to below 3,350 nits within 4 minutes, while the temperature of the Al heat sink for the LEDs reached only 40 degree C. Comparing to CCFLs, these results were horrible. So, again the LEDs were not ready for VHB backlights.

Also in 2002, a 10.4" LED backlight was put onto the Sharp LQ104V1DC31 LCD panel. This unit was shown at SID2002 to just demonstrate the concept.

By early 2005, we had a 10.4" LCD with a backlight using white LEDs. The LCD panel was the AUO B104SN02 which was used in our LM161 VHB module with a CCFL backlight. The screen brightness of this unit was 500 nits. Comparing to the 1,450 nits LM161, the unit with the LED backlight was much dimmer and had bad color gamut. We showed this unit at SID2005 to demonstrate the white LED backlight.

In 2007, a 12.1" VHB LCDs with LED backlight was put together. The LCD panel was the ChiMei G121X1-L01 which was used in our LM190 module with a CCFL backlight. The brightness of this LED unit was 1,280 nits with a backlight power of 18.8 Watts. In comparison, our LM190 with a CCFL backlight had 1,650 nits brightness with a backlight power of 24 Watts. So finally, the LED backlight matched up the brightness versus power performance of our best CCFL backlights.

Reaching the final Frontier to introduce the VHB LED Backlights

In summer of 2007, Landmark started to search for the best LED light strip and the driving chip to design the state of the art LED backlights to be used on a family of VHB LCD modules planned for market introduction by the second half of 2008.

By July 2008, we got the first prototype 12.1" VHB LCD with an AUO G121SN01 LCD. At full brightness setting, the backlight delivered 1,600 nits screen brightness with a total power consumption of 13 Watts. This performance is significantly better than the existing LM176-SN01 VHB LCD which uses the same LCD with a CCFL backlight.

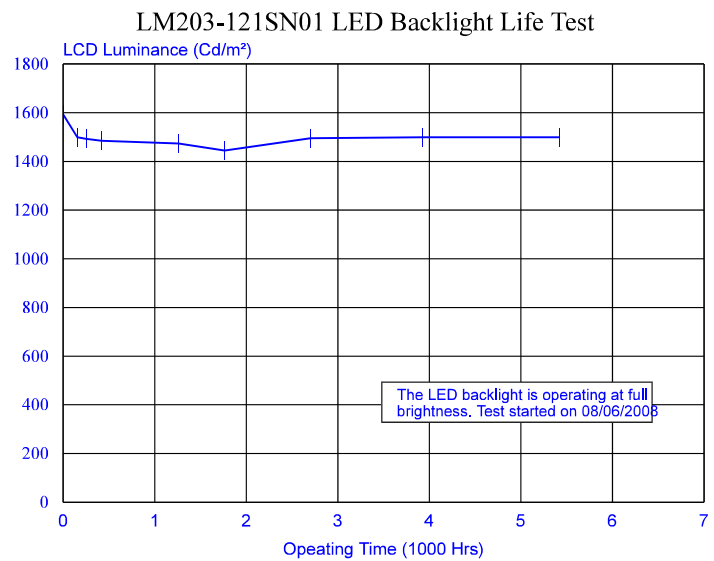


Fig. 2. Screen Brightness vs. Operating Hours. (LMG203-121SN01)

Immediately, an operating life test on this unit was started in early August. As of today, it has accumulated 5,500 hours of operating life test. The curve above shows the LCD screen brightness versus the operating hours

After 5,500 hours of operation, the LCD screen brightness drops from 1,593 nits to 1,499 nits. In percentage, the brightness drops by only 5.9%. Therefore, we have reaching the final frontier to make the decision of introducing the VHB LCDs with LED backlights.

Our manufacturing has produced the first batch of 12.1" LMG207-121X1 VHB LCDs with LED backlights. In the meantime, an LED driving board LD200 has been designed. The backlight control specifications of LD200 are compatible to those of Landmark inverters. Therefore, it works seamlessly with our LCD controller cards and the accessories, such as PS200 photosensor, for LCD screen brightness adjustments.