Rugged 6.4" High Efficiency Indirect Sunlight Readable LCD (Model: MCH6400-IP)

Introduction

MCH6400-IP is a 6.4" high efficiency indirect sunlight readable LCD module. The module consists of a Sharp's LQ064V3DG01 active matrix thin film transistor (AM TFT) addressed color LCD and a high brightness LED backlight for high screen luminance and also capable of operating under extreme temperature and rugged weather (IP66) condition.

At the maximum backlight power of 4/8 Watts, the MCH6400-IP module delivers a LCD screen brightness of 650/1000 cd/m² (nits). At this brightness level, the display is highly readable under sunlight. With a wide dimming range LED drive power such as i-Tech CVE2-V6, the screen brightness can be adjusted down to about 10 cd/m².

The MCH6400-IP module displays an excellent color image at 640x480 resolution with 6 bits color depth for up to 262,144 colors. Coupled with its high screen luminance, the display is highly suitable for various outdoor applications.

Characteristics (Note 1 & 2)

Parameters	Typical Value	Units	Conditions
LCD Screen Luminance:	650/1000	cd/m²	White (LCD in On state)
Luminance Uniformity	20% or better		Note 3
Backlight Power Consumption	4/8	Watts	Excluding power source losses
Screen Dimming Ratio	100:1		With CVE2-V3 LED power board
Typical LCD Contrast Ratio	350		White vs. Black (measured in total dark at the normal direction)
Typical Viewing Angles			
3:00 to 9:00 direction	± 70	Degrees	Contrast ratio > 5
6:00 to 12:00 direction	-40 to +60	Degrees	Contrast ratio > 5
3:00 to 9:00 direction	± 70	Degrees	Screen luminance >250 Cd/m2
6:00 to 12:00 direction	- 40 to +60	Degrees	Screen luminance >250 Cd/m2
LCD Screen Chromaticity			
White	x = 0.342, y = 0.365		Note 4
Red	x = 0.557, y = 0.359		Note 4
Green	x = 0.314, y = 0.556		Note 4
Blue	x = 0.155, y = 0.155		Note 4
Working Temperature	-25 o C to +60 o C		
Storage Temperature	-30 o C to +80 o C		

Note 1: Please refer to the Sharp LQ064V3DG01 data sheets for detail.
Note 2: All data is measured at 25°C ± 2°C ambient temperature.
Note 3: Uniformity = (Lmax - Lmin) / (Lmax + Lmin) where Lmax (Lmin) is the maximum (minimum) luminance measured with a 10 mm diameter meter aperture over the LCD active area except the last 10 mm area from the edges.
Note 4: Measured at the direction normal (perpendicular) to the LCD.

Thermal Management

This LED backlight consumes a significant amount of power and as a result, the LCD temperature of the module will be higher than normal. In addition, the front surface of an LCD is a good sunlight absorber. Placing an LCD under strong direct sunlight can cause a significant temperature rise even without the extra heating from the backlight power.

The exact amount of temperature rise due to these two factors depends on how the LCD module is mounted and also depends on the heat dissipation design. For example, if the LCD is mounted vertically, a significant portion of the LED backlight heat will be dissipated into the air without heating up the LCD panel, and as a result, the LCD temperature rising will be low. On the other hand, if the LCD module is mounted horizontally, then almost all of the backlight heat rises to warm the LCD panel.

With the MCH6400-IP module operating at its maximum brightness, the LCD temperature rise due to the LED backlight is about 5 to 10° C. The absorption of direct sunlight, in the extreme cases, can heat up the LCD by more than 40° C! Therefore, it is recommended that the LCD temperature be measured at full display brightness in the installed equipment under actual operating environments (for example, on a summer day with full sunshine). The cooling solution should then be designed accordingly. Please make sure that the specified maximum LCD temperature is not exceeded.

Backlight Life

The backlight life is usually specified in half brightness life, which is the cumulative number of operating hours before the backlight luminance drops down to 50% of its initial value. The LED backlight in the MCH6400-IP LCD module is rated at 60,000 hours when it is operated at the maximum brightness. The backlight life is mainly determined by the LED life. LED life depends strongly on the operating current. If the LEDs are operated at a reduced current, then the half brightness life of the LED backlight can be extended far beyond the specified 50,000 hours.

Mechanical Specifications